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# CMS Phase Semiannual Shoreline Groundwater Monitoring Report, February 2010

## Boeing Plant 2
## Seattle/Tukwila, Washington

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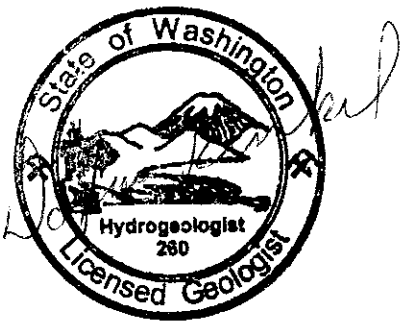

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## LIST OF ACRONYMS AND ABBREVIATIONS

| Acronym/Abbreviation | Definition |
|---|---|
| ACMER | Alternative Corrective Measures Engineering Report |
| ARI | Analytical Resources, Incorporated |
| bgs | below ground surface |
| CMS | Corrective Measures Study |
| COCs | Contaminants of Concern |
| cDCE | cis-1,2-dichloroethene |
| tDCE | trans-1,2-dichloroethene |
| DSOA | Duwamish Sediment Other Area |
| EPA | U.S. Environmental Protection Agency |
| EPI | Environmental Partners, Inc. |
| Facility | The Boeing Company's Plant 2 Facility |
| GPRA | Government Performance and Results Act |
| IMs | Interim Measures |
| NTUs | nephelometric turbidity units |
| Order | RCRA Order on Consent |
| PCBs | polychlorinated biphenyls |
| PMCL | Preliminary Media Cleanup Level |
| PP | Priority Pollutant |
| QAPP | Quality Assurance Project Plan |
| QA | Quality Assurance |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| SVOCs | Semi-Volatile Organic Compounds |
| TCE | Trichloroethene |
| µg/L | micrograms per liter |
| VC | Vinyl Chloride |
| VOCs | Volatile Organic Compounds |
| Weston | Roy F. Weston, Inc. or Weston Solutions |

## 1.0 INTRODUCTION

This report presents the results of groundwater monitoring activities conducted during the February 2010 semiannual sampling event of Corrective Measures Study (CMS) groundwater monitoring at The Boeing Company's Plant 2 Facility (the Facility) in Seattle/Tukwila Washington. This report has been prepared to comply with the requirements of the Administrative Order on Consent (the Order) issued by the U.S. Environmental Protection Agency (EPA) to Boeing under the authority of Section 3008 (h) of the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 USC 6928 (h). This Order [RCRA Docket No. 1092-01-22-3008 (h)] became effective on January 18, 1994.

Beginning in 2001, groundwater samples were collected and analyzed in support of two separate and concurrent evaluations. The first evaluation, referred to as the Sediment Cap Impact Evaluation, is described in the *CMS Phase Sediment Cap Impact Evaluation Groundwater Monitoring Plan, Boeing Plant 2* (Weston 2001a). This first evaluation was designed to provide an assessment of the potential for contaminated groundwater discharging from the Facility to contaminate the clean sediment backfill that is proposed as part of the Duwamish Sediment Other Area (DSOA) remedy. The second evaluation is described in the *CMS Phase Effectiveness of Buildings 2-10 and 2-66 Interim Measures Monitoring Plan* (Weston, 2001b). This second evaluation was designed to assess the effectiveness of the sheet pile containment structure Interim Measures (IMs) and is referred to as the Effectiveness Evaluation. Both evaluations involved groundwater monitoring of wells on a quarterly basis for a year. Hydraulic data generated during the initial phase of the IM Effectiveness Evaluation was reported separately in the report titled *Initial CMS Phase Effectiveness of Buildings 2-10 and 2-66 Interim Measures Monitoring Report* (Weston 2001c).

The monitoring wells included in these programs were sampled quarterly for a period of one year in 2001-2002. Results of each quarterly groundwater sampling event were reported in CMS Phase Quarterly Groundwater Monitoring Reports (Weston 2001d, 2001e, 2002a and 2002b). Work described in those reports was conducted in accordance with the project work plans and with the *RCRA Facility Investigation (RFI) Work Plan* (Weston 1994).

Data from all four quarterly events during 2001-2002 were combined with hydrogeologic data to assess the concentrations and mass of constituents potentially being discharged along the Duwamish Waterway shoreline by the groundwater from the Facility. The potential for sediment cap impacts were assessed using two approaches: a total mass loading analysis and an equilibrium partitioning analysis. Information from the four rounds of sampling was also used to assess the effectiveness of the Building 2-10 and Building 2-66 sheet pile structures (IM Effectiveness Evaluation).

The current shoreline groundwater monitoring program is based on the results of the original shoreline monitoring program, *CMS Phase Sediment Cap Impact Evaluation Groundwater Monitoring Plan, Boeing Plant 2* (Weston 2001a). Following review of those results as specified by Section 4.1 of that work plan, the original monitoring program was modified to establish the present version of the Shoreline Monitoring Program as documented in a Boeing letter to EPA dated July 14, 2003. Additionally, and starting with an email from EPA on January 23, 2004, EPA and Boeing discussed the presentation formats of the quarterly data; the results of these discussions are reflected beginning with the December 2003 and February 2004 reports.

Field data sheets are included with each shoreline report. Because of their quantity, field data sheets and chain of custody records are presented only in the electronic copy of this report. The electronic files for this report are located in the CD ROM that is in a pocket attached to the cover of this document.

In a letter dated September 4, 2009 EPA required semiannual monitoring for nickel and manganese at four C level wells that were not part of the shoreline monitoring network. Beginning with this sampling event Boeing has added nickel and manganese sampling at PL2-420C, PL2-425C, PL2-443C, and PL2-026C. The well location map and sampling matrix in Figure 1-1 has been updated to reflect these four additional wells and additional sampling requirements for manganese and nickel.

A plan view map of the Facility showing the 32 monitoring wells comprising the current shoreline monitoring network is presented in Figure 1-1. The monitoring wells comprising this network are hereafter referred to as the Shoreline Monitoring Wells.

Sampling data from the February 2010 semiannual monitoring event were obtained and analyzed under the present program hereafter referred to as the Shoreline Monitoring Program. A description of field activities and groundwater monitoring results are presented and discussed in Section 2 of this report.

# 2.0 CMS PHASE SHORELINE GROUNDWATER MONITORING PROGRAM

## 2.1 Monitoring Objectives and Approach

The Shoreline Groundwater Monitoring Program data have been used for IM effectiveness evaluations, EPA's Government Performance and Results Act (GPRA) goals, and in Sediment Cap Impact Evaluation calculations. The primary objective of the IM Effectiveness Evaluation is presently to evaluate current groundwater quality downgradient of IM sheet pile structures. An additional objective of the Sediment Impact Evaluation is to provide data that allow calculations of estimated contaminant loading to the DSOA sediment cap from contaminated groundwater discharging from beneath the Facility. Over time, an objective of both evaluations is to generate downgradient groundwater quality data for support of future phases of the CMS. To meet these objectives, groundwater is sampled from the 28 shoreline monitoring wells located along the Duwamish Waterway.

Construction data for the shoreline monitoring wells are presented in Table 2-1. Groundwater samples collected as part of this monitoring program are analyzed for the constituents identified during RCRA Facility Investigation (RFI) activities performed at the Facility (Weston 1997). The analytical list is comprised of the following constituent groups: volatile organic compounds (VOCs), PCBs, and the 13 total and dissolved priority pollutant (PP) metals plus manganese and vanadium.

## 2.2 Monitoring Activities

During the February 2010 sampling event, groundwater samples were obtained from all 32 shoreline monitoring wells. Samples from 27 shoreline monitoring wells were analyzed for VOCs. Samples from 22 shoreline monitoring wells were analyzed for the 13 total and dissolved priority pollutant metals plus manganese and vanadium. Samples from wells PL2-026C, PL2-420C, PL2-425C, and PL2-443C were analyzed for manganese and nickel only. Samples from wells PL2-036A and PL2-036AR were analyzed for VOCs, metals, and PCBs. The February 2010 shoreline monitoring event was initiated on February 8, 2010 and was completed on February 11, 2010.

Groundwater samples were obtained using dedicated bladder pumps installed in each of the shoreline monitoring wells. The dedicated pumps are Well Wizard® pneumatic bladder sampling pumps, model # PM1150, manufactured by QED Environmental Systems, Inc. Pump intake depths are presented with well construction data in Table 2-1. The pump bladders are Teflon® and the riser tubing (the tubing that contacts the water sample) is Teflon®-lined polyethylene. Bladder pumps are typically activated using compressed air or nitrogen; compressed nitrogen is used to activate the pumps in the shoreline monitoring program.

Prior to sampling, monitoring wells were purged following low-flow purging guidance. Field measurements of water quality parameters (pH, temperature, dissolved oxygen, redox, turbidity, and conductivity) were logged every minute during purging using an in-line water quality meter with data logging capabilities. Low-flow purging continued until water quality parameters stabilized over at least three successive readings within the following guidelines:

- ± 0.1 pH unit
- ± 3 percent for conductivity
- ± 10 percent for dissolved oxygen

An additional guideline regarding turbidity is followed during purging. Wells are purged until turbidity readings of approximately 10 nephelometric turbidity units (NTUs) or less are obtained. If turbidity readings significantly exceed 10 NTUs, the wells are purged until a minimum of one casing volume is extracted or the turbidity readings stabilize.

Water quality field parameter final stabilization data for each shoreline monitoring well are presented in Table 2-2. Groundwater sampling, sample handling, and laboratory analysis was conducted in accordance with the project work plans (Weston 1994 and 2001a) and *Quality Assurance Project Plan Addendum, Groundwater RCRA Facility Investigation Work Plan, Boeing Plant 2, Seattle/Tukwila, Washington* (QAPP) (Weston 2001f). Copies of field logs and chain of custody forms are presented as an attachment in the electronic version of this report.

VOC, PCB, and total and dissolved metals analyses were performed by Analytical Resources Incorporated (ARI) of Tukwila, Washington in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA SW-846, 3rd edition) and *EPA Method 200.8, Revision 5.5; Determination of Trace Elements in Water and Wastes by Inductively Coupled Plasma-Mass Spectrometry* and ARI SOPs. Low-level mercury samples were analyzed by EPA Method 7470A Modified. Arsenic and selenium analyses for samples from C level wells are performed by Frontier GeoSciences Laboratory of Seattle, Washington using Hydride Generation Atomic Fluorescence Spectrometry Method. Dissolved metals samples were field filtered with an in-line 0.45µ cartridge filter connected directly to sample tubing.

## 2.3 Results and Discussion

A summary of all detected constituents (VOCs, dissolved metals, total metals, and PCBs) is presented in Table 2-3. A data summary table showing results for all analyzed constituents, whether detected or not, is presented in Attachment A. A Quality Control (QC) data validation memorandum for this monitoring event is provided in Attachment B.

Discussions of detected constituents, current concentration ranges, and concentration trends over time are divided by constituent group and presented in the following sections.

### 2.3.1 VOC Results

During the February 2010 sampling event 27 of the 32 shoreline monitoring wells were sampled for VOCs in groundwater as summarized in the sampling matrix presented in Figure 1-1. Analytical data from the February 2010 shoreline monitoring event contain detections of following nine VOCs:

Acetone
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
cis-1,2-Dichloroethene (cDCE)
trans-1,2-Trichloroethene (tDCE)
Trichloroethene (TCE)
Vinyl Chloride (VC)

A series of figures graphically illustrating the location and distribution of TCE, cDCE, tDCE and VC results for each shoreline monitoring well are provided as Figures 2-1a through 2-1c. These four VOC compounds were selected for graphical presentation due to their relative frequency of detection, particularly in areas of the sheet pile interim measures, and because they are the chlorinated VOCs and their breakdown products associated with historical Plant 2 operations. If other VOCs that are associated with Plant 2 operations are detected with similar frequency during future sampling events, they will be added to the figures in the reports for those events.

Graphs of TCE, cDCE, tDCE, and VC concentrations over time are used to assess contaminant concentration trends for each shoreline monitoring well. Current analytical results are shown along with the results from previous shoreline monitoring events in the time series graphs presented in Figures 2-2a through 2-2j. These figures graphically illustrate concentration trends of the four commonly detected chlorinated VOCs at each of the shoreline monitoring wells. Pre-shoreline monitoring data and data from other monitoring programs are not presented on the time series graphs because those samples may have been collected following protocols that are not sufficiently comparable to the shoreline monitoring program.

Observations regarding VOC detections for this sampling event are presented in the following bullets:

- Nine of the 39 VOCs analyzed were detected in at least one sample collected from one or more of the shoreline monitoring wells sampled during this monitoring event.

- Of the 17 A level wells sampled for VOCs, analytical results for samples collected from six wells had at least one VOC detected with concentrations greater than screening levels. The samples from the remaining 11 wells had no VOC detections at concentrations greater than screening levels.

- Six B level wells were sampled for VOCs during this shoreline monitoring event. VC was detected at a concentration greater than its screening level in the sample from well PL2-JF01B. Samples from the five remaining B level wells had no VOC detections at concentrations greater than screening levels.

- Four C level wells were sampled for VOCs during this shoreline monitoring event. Analytical results indicate that no VOCs were detected in the four C level well samples.

Observations regarding the nine VOC compounds detected during the current sampling event are summarized below. All references to screening levels are screening levels for the protection of surface water unless otherwise noted.

- Acetone was detected in the sample from PL2-043B at a concentration of 15 µg/L, which is less than the screening level under the draft CMS of 6,430,000 µg/L.

- Benzene was detected in the sample from PL2-JF01AR at a concentration of 4.9 µg/L, which is slightly greater than the screening level under the draft CMS of 4.48 µg/L.

- Carbon tetrachloride was detected in the samples from PL2-015A, PL2-015AR, and the field duplicate sample from PL2-015AR at concentrations of 1.0 µg/L, 1.2 µg/L, and 1.1 µg/L, respectively. All three concentrations are greater than the screening level under the draft CMS of 0.526 µg/L.

- Chlorobenzene was detected in the sample from PL2-JF01AR at a concentration of 36 µg/L. Chlorobenzene is not a COC for groundwater at the facility; however, the screening level is 1,600 µg/L under the draft CMS.

- Chloroform was detected in the samples from PL2-015A, PL2-015AR and the field duplicate from PL2-015AR at concentrations of 2.2 µg/L, 3.4 µg/L, and 3.2 µg/L, respectively. These concentrations are less than the screening level under the draft CMS of 56.1 µg/L.

- cDCE was detected in samples from PL2-607A and PL2-258B at concentrations of 3.9 µg/L and 50 µg/L, respectively. Neither of the samples had a cDCE concentration greater than the draft CMS screening level of 1,550 µg/L. Additional information regarding cDCE concentrations in shoreline monitoring well samples can be found in the time series graphs presented in Figures 2-2a through 2-2j.

- tDCE was detected in the sample from PL2-258A at a concentration of 2.3 µg/L. This concentration is less than the draft CMS screening level of 10,000 µg/L. Additional information regarding tDCE concentrations in shoreline monitoring well samples can be found in the time series graphs presented in Figures 2-2a through 2-2j.

- TCE was detected in samples from PL2-013A, PL2-607A, PL2-015A, PL2-015AR, and the field duplicate sample from PL2-015AR at concentrations of 1.9 µg/L, 2.8 µg/L, 6.7 µg/L, 20 µg/L, and 20 µg/L, respectively. All detected TCE concentrations are greater than the draft CMS screening level of 0.302 µg/L for TCE. Additional information regarding TCE concentrations in shoreline monitoring well samples can be found in the time series graphs presented in Figures 2-2a through 2-2j.

- VC was detected in samples from PL2-607A, PL2-258A, PL2-JF01AR, and PL2-JF01B at concentrations of 2.0 µg/L, 300 µg/L, 100 µg/L, and 20 µg/L, respectively. All detected VC concentrations are greater than the draft CMS screening level of 0.731 µg/L for VC. Additional information regarding VC concentrations in shoreline monitoring well samples can be found in the time series graphs presented in Figures 2-2a through 2-2j.

A summary of the number of VOC detections, percentage of shoreline wells with detections, number and percentage of detections at concentrations greater than 2004 Draft CMS screening levels, and

concentration range of detected values is presented in Table 2-4. Field duplicate samples are not included in the counts of detections and concentrations greater than screening levels in Table 2-4.

### 2.3.2 Mann-Kendall Trend Analysis for VOCs

In addition to analytical results, Figures 2-1a through 2-1c and Table 2-5 contain results of a Mann-Kendall statistical analysis for trend in VOC concentrations at each shoreline well. A statistically significant upward trend in concentration is noted as "UP", a downward trend is noted as "DOWN", and, if there is no statistically significant trend in the data, then "NT" is used to signify no trend. All statistically valid VOC trends in shoreline well sample results are downward. Figures 2-1a through 2-1c also present a comparison of the most recent VOC concentration data to their 2004 CMS screening levels. If the most recent VOC concentration is greater than its screening level, it is noted with a ">" symbol. If the most recent VOC concentration is less than its screening level, it is noted with a "<" symbol. Some apparent statistically significant trends are solely the result of changes in analytical reporting limits and are considered as having no statistically significant trend. This condition is a result of the standard practice of treating non-detects as half the detection limit when entering data into the Mann-Kendall statistical equations.

Most of the well/parameter combinations do not exhibit a statistically significant trend based on the Mann-Kendall analysis. In most cases, this is the result of a high percentage of non-detects for a particular VOC; in the remaining cases, there was not a statistically significant trend in the data. Apparent trends that are solely the result of a change in the analytical reporting limit are treated as having no statistically significant trend.

In 34 of the 35 cases where a statistically significant trend was noted in VOC data, the concentration trend was downward. Twenty-nine of the 34 statistically significant downward trends have VOC concentrations for their most recent data that are less than their respective screening levels and five are greater than their respective screening levels. A statistically significant upward trend was noted in the vinyl chloride data from well PL2-607A. In addition, the most recent vinyl chloride concentration for the sample from PL2-607A is greater than its screening level. Observations regarding results of the Mann-Kendall test for trend for VOCs are noted in Table 2-5 and are summarized below:

- TCE concentrations exhibit statistically significant downward trends in samples from five wells, PL2-607A, PL2-015A, PL2-015AR, PL2-030A, and PL2-JF01AR. The most recent TCE data from PL2-030A and PL2-JF01AR are at concentrations less than the TCE screening level of 0.302 µg/L. The most recent TCE sample results from wells PL2-607A, PL2-015A, and PL2-015AR are at concentrations greater than the TCE screening level.

- cDCE concentrations exhibit a statistically significant downward trend in samples from 12 shoreline monitoring wells. The most recent cDCE data from all 12 wells with statistically significant trends are at concentrations less than the cDCE screening level of 1,550 µg/L.

- tDCE concentrations exhibit a statistically significant downward trend in samples from six shoreline monitoring wells, PL2-030A, PL2-043B, PL2-044B, PL2-258A, PL2-258B, and PL2-

JF01AR. The most recent tDCE data from all six wells with statistically significant trends are at concentrations less than the tDCE screening level of 10,000 µg/L.

- VC concentrations exhibit a statistically significant downward trend in data from 11 shoreline monitoring wells. The most recent data from nine of the 11 wells with statistically significant downward trends are at concentrations less than the VC screening level of 0.731 µg/L. The most recent sample results from wells PL2-258A and PL2-JF01B are at concentrations greater than the VC screening level. VC concentrations exhibit a statistically significant upward trend in data from PL2-607A. The most recent VC concentration in the sample from PL2-607A is greater than its screening level of 0.731 µg/L.

### 2.3.3 Metals Results

During the February 2010 sampling event, 22 shoreline monitoring wells were sampled for dissolved and total metals in groundwater. In addition, four C level wells were sampled for manganese and nickel only as summarized in the sampling matrix presented in Figure 1-1. Samples were analyzed for 18 metals; thallium was not detected in any samples. Analytical data from the current event of the shoreline monitoring program contain detections of following 17 metals:

| | | |
|---|---|---|
| Antimony | Copper | Nickel |
| Arsenic | Iron | Selenium |
| Beryllium | Lead | Silver |
| Cadmium | Magnesium | Vanadium |
| Calcium | Manganese | Zinc |
| Chromium | Mercury | |

Analytical results for metals are summarized on Figures 2-3a through 2-3c. The 11 metals presented in Figures 2-3a through 2-3c were selected from the full metals list of 18 metals analyzed because historically, they have been detected at concentrations greater than their respective Preliminary Media Cleanup Levels (PMCLs) (Weston 1999) in shoreline monitoring wells or are associated with past site operations. Both total (unfiltered) and dissolved (filtered) metals results are presented in the figures so that comparisons can be made between the two data sets. In addition, low-level mercury samples were collected and analyzed for all sample locations as described in Section 2.2. Low-level mercury samples were run as totals (unfiltered) and dissolved (filtered in the laboratory).

During the annual sampling event arsenic and selenium samples from C level wells are analyzed using the both the standard Method 200.8 and the hydride method. The hydride method is used to reduce matrix interference issues caused by saline groundwater in the C level of the aquifer. In the Annual report both sets of results are presented in Table 2-3 and Attachment A, but only results from the hydride method are used for statistical evaluations and data summaries.

A comparison of the total and dissolved metals data sets shows that there is good agreement between the detected concentrations and data generated during previous monitoring events. Total and dissolved metals data sets for the samples from some wells have some discrepancies where the analytical results from the total metals and dissolved metals aliquots are not comparable, which may be due to high

turbidity. Discrepancies are most notable in the samples from PL2-015A for copper and zinc (greater total concentrations), PL2-043B for nickel and selenium (greater dissolved concentrations), and PL2-233A for arsenic, chromium, copper, mercury, and vanadium (greater total concentrations).

In two of the three cases noted in the preceding paragraph the total metals concentrations were significantly greater than the dissolved metals concentrations, which is likely due to turbidity in the total metals sample. However, the dissolved metals concentrations were significantly greater than total metals concentrations for nickel and selenium in the sample from PL2-043B. Turbidity measurements for samples from wells PL2-015A, PL2-043B, and PL2-233A are 34, 6.8, and 900 NTU, respectively.

Observations regarding metals detections during the current sampling event are presented in the following bullets:

- Seventeen of the 18 metals analyzed were detected at least once in samples collected from the shoreline monitoring wells. Thallium was not detected in any shoreline monitoring samples analyzed during this event.

- Seventeen of the 18 A level wells in the shoreline monitoring program were sampled for dissolved and total metals during the current shoreline monitoring event. Samples from 10 of the 17 A level wells sampled this event had no detections of dissolved or total metals at concentrations greater than screening or background levels. Samples from PL2-013A, PL2-015A, PL2-036AR, PL2-233A, PL2-271A, PL2-425A, and PL2-JF01AR had detections of dissolved or total metals at concentrations greater than screening or background levels.

- Five of the six B level wells in the shoreline monitoring program were sampled for dissolved and total metals during the current shoreline monitoring event. Well PL2-044B was not sampled during this event, consistent with the sampling schedule presented in Figure 1-1. Samples from PL2-015B and PL2-JF01B had no detected concentrations of total or dissolved metals greater than screening or background levels. Samples from PL2-043B, PL2-214B and PL2-258B had detections of dissolved or total metals at concentrations greater than screening or background levels.

- Four C level wells were sampled for dissolved manganese and nickel during the current shoreline monitoring event. The sample from PL2-425C had concentrations of dissolved manganese and nickel less than screening or background levels. Samples from C level wells, PL2-026C, PL2-420C, and PL2-443C, had detections of dissolved manganese or nickel at concentrations greater than screening or background levels

Observations regarding 13 of the 16 metals detected during the current sampling event are presented in Table 2-5 and are summarized below. Analytical results for the metals calcium, iron, and magnesium are not evaluated due to their ubiquitous and natural occurrence and lack of screening levels. All references to screening levels are for the protection of surface water unless otherwise noted.

- Dissolved antimony was detected in samples from five shoreline monitoring wells at concentrations ranging from 0.5 µg/L to 6.1 µg/L. Total antimony was detected in samples from six shoreline monitoring wells at concentrations ranging from 0.4 µg/L to 6.3 µg/L. Total and

dissolved antimony were both detected in the field duplicate from well PL2-015AR. Antimony is not a COC for groundwater at the facility; however, its screening level is 513 µg/L under the draft CMS and all detected antimony concentrations are significantly less than this screening level.

- Dissolved arsenic was detected in samples from 20 shoreline wells at concentrations ranging from 0.4 µg/L to 18.0 µg/L, with the greatest concentration in the sample from PL2-271A. Samples from two wells, PL2-271A and PL2-425A had dissolved arsenic concentrations greater than the background concentration of 8.0 µg/L. Total arsenic was detected in samples from 18 shoreline wells at concentrations ranging from 0.6 µg/L to 37.5 µg/L, with the greatest concentration in the sample from PL2-233A. Three total arsenic detections, in samples from PL2-233A, PL2-271A, and PL2-425A, are at concentrations greater than the background adjusted screening level of 8.0 µg/L.

- Dissolved beryllium was not detected in any samples from shoreline wells. Total beryllium was detected in the sample from PL2-233A at a concentration of 0.7 µg/L, which is significantly less than the beryllium screening level of 135 µg/L under the draft CMS.

- Dissolved cadmium was detected in the sample from PL2-013A, at a concentration of 37 µg/L. Total cadmium was also detected in the sample from PL2-013A at a concentration of 38 µg/L. Both dissolved and total cadmium concentrations for samples from PL2-013A are greater than the draft CMS cadmium screening level of 8.8 µg/L.

- Dissolved chromium was not detected in any samples from shoreline wells. Total chromium was detected in samples from PL2-030A and PL2-233A at concentrations 5.0 µg/L and 25 µg/L, respectively. Chromium is not a COC for groundwater at the facility; however, it has a screening level is 50 µg/L under the draft CMS. None of the detected chromium concentrations are greater than the screening level. The dissolved and total chromium result for the samples from PL2-233A are non-detect at a reporting limit of 5.0 µg/L and detected at 25 µg/L, respectively. Sample turbidity in the sample from PL2-233A was measured at 900 NTU indicating that the total chromium detection was likely attributable to turbidity. The screening level for chromium is based on the screening level for chromium VI, which is the more toxic form of chromium. Chromium results from shoreline well samples represent both chromium III and chromium VI.

- Dissolved copper was detected in 16 samples from shoreline wells at concentrations ranging from 0.5 µg/L to 23 µg/L, with the greatest concentration in the sample from PL2-013A. One dissolved copper concentration, from PL2-013A, was at a concentration greater than the background adjusted copper screening level of 8.0 µg/L. Total copper was detected in 17 samples from shoreline wells at concentrations ranging from 0.6 µg/L to 30 µg/L, with the greatest concentration in the sample from PL2-013A. Three total copper concentrations, in samples from PL2-013A, PL2-015A, and PL2-233A, are greater than the background adjusted screening level of 8.0 µg/L.

- Dissolved lead was not detected in any samples from shoreline wells. Total lead was detected in five samples from shoreline wells PL2-013A, PL2-015A, PL2-036A, PL2-036AR, and PL2-

233A at concentrations of 4.0 µg/L, 6.0 µg/L, 1.0 µg/L, 2.0 µg/L, and 2.0 µg/L, respectively. None of the detected lead concentrations are greater than the screening level of 8.1 µg/L.

- Dissolved manganese was detected in samples from 21 shoreline wells at concentrations ranging from 6.0 µg/L to 6,080 µg/L, with the greatest concentration in the sample from PL2-258B. Total manganese was detected in samples from all 22 shoreline wells sampled for total manganese at concentrations ranging from 2.0 µg/L to 6,330 µg/L. The greatest total manganese concentration was in the sample from PL2-258B. Five dissolved and three total manganese samples are at concentrations greater than the background-adjusted screening level of 2,000 µg/L.

- Dissolved mercury was not detected in any samples from shoreline wells. Total mercury was detected in the sample from one well, PL2-233A, at a concentration of 0.076 µg/L. This concentration is greater than the draft CMS screening level of 0.025 µg/L. The measured turbidity in the sample from PL2-233A was 900 NTU indicating that turbidity may have affected sample results for total metals.

- Dissolved nickel was detected in samples from all 26 shoreline wells sampled for dissolved nickel at concentrations ranging from 0.6 µg/L to 33 µg/L, with the greatest concentration in the sample from PL2-013A. Total nickel was detected in samples from all 22 shoreline wells sampled for total nickel at concentrations ranging from 0.5 µg/L to 35 µg/L. The greatest total nickel concentration was in the sample from PL2-013A. Five dissolved nickel and two total nickel samples are at concentrations are greater than the screening level of 8.2 µg/L.

- Dissolved selenium was detected in the samples from PL2-013A and PL2-043B at concentrations of 50 µg/L and 320 µg/L, respectively. The selenium concentration of the sample from PL2-043B is less than the screening level of 71 µg/L. Total selenium was not detected in samples from any shoreline monitoring wells.

- Dissolved silver was detected in the sample from PL2-013A at a concentration of 9.1 µg/L. Total silver was detected in samples from PL2-013A and PL2-233A at concentrations of 10.2 µg/L and 0.2 µg/L, respectively. The concentrations of both dissolved and total silver in the sample from PL2-013A are greater than the screening level of 1.9 µg/L.

- Dissolved vanadium was detected in samples from 11 shoreline wells at concentrations ranging from 4.0 µg/L to 14 µg/L, with the greatest concentration in the sample from PL2-233A. Total vanadium was detected in samples from 14 shoreline wells at concentrations ranging from 3.0 µg/L to 123 µg/L, with the greatest concentration in the sample from PL2-233A. As noted above, the turbidity measurement in the sample from PL2-233A was 900 NTU and sample turbidity may have affected total metals results. Vanadium is not a COC for groundwater at the facility; however, its screening level is 2,810 µg/L under the draft CMS. None of the dissolved or total vanadium concentrations are greater than its screening level.

- Dissolved zinc was detected in samples from shoreline wells PL2-013A, PL2-015A, and PL2-036AR at concentrations of 1,250 µg/L, 40 µg/L, and 430 µg/L, respectively. Total zinc was detected in samples from shoreline wells PL2-013A, PL2-015A, PL2-036AR, PL2-233A, and

PL2-JF01AR at concentrations of 1,320 µg/L, 60 µg/L, 530 µg/L, 10 µg/L, and 10 µg/L, respectively. Two dissolved and three total zinc samples from have detections at concentrations greater than the zinc screening level of 81.0 µg/L.

Time-series graphs of dissolved arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc concentrations are presented in Figures 2-4a through 2-4j. These figures graphically illustrate dissolved concentration trends of eight metals in samples from the shoreline monitoring wells. The eight metals selected for time series graphs are the same eight metals used in Sediment Cap Impact Evaluation calculations. Pre-shoreline monitoring data and data from other monitoring programs are not presented on the graphs because those samples may have been collected following protocols that are not consistent with the shoreline monitoring program.

A summary of the number of total and dissolved metals detections, percentage of shoreline monitoring wells with detections, number and percentage of detections at concentrations greater than 2004 Draft CMS screening levels or 2006 background-adjusted screening levels, and concentration range of detected values is presented in Table 2-6.

### 2.3.4 Mann-Kendall Trend Analysis for Metals

In addition to analytical results, Figures 2-3a through 2-3c and Table 2-7 also contain results of the Mann-Kendall statistical analysis for trend in eight dissolved metals concentrations at each shoreline well. The eight metals selected for time series graphs are the same eight metals used in Sediment Cap Impact Evaluation calculations. A statistically significant upward trend in concentration is noted as “UP”, a downward trend is noted as “DOWN”, and, if there is no statistically significant trend in the data, then “NT” is used to signify no trend. Figures 2-3a through 2-3c also present a comparison of the most recent dissolved metals concentration data to their 2004 screening levels. If the most recent dissolved metal concentration is greater than its screening level, it is noted with a “>” symbol. If the most recent dissolved metal concentration is less than its screening level, it is noted with a “<” symbol. Some apparent statistically significant trends are solely the result of changes in analytical reporting limits and are considered as having no statistically significant trend. This condition is a result of the standard practice of treating non-detects as half the detection limit when entering data into the Mann-Kendall statistical equations.

Most of the well/parameter combinations do not exhibit a statistically significant trend based on the Mann-Kendall analysis. In most cases this is the result of a significant percentage of non-detects for a particular metal; in the remaining cases there was simply not a statistically significant trend in the data.

There are 21 cases where a statistically significant trend was noted in dissolved metals data. Of these, 13 trends are downward and eight trends are upward. Ten of the 13 statistically significant downward trends have concentrations for their most recent data that are less than their respective screening or background levels. The most recent data for arsenic at PL2-271A and PL2-425A and copper at PL2-013A are at concentrations greater than their respective background levels but exhibit downward trends. One of the eight statistically significant upward trends, zinc in the sample from PL2-036AR, has a concentration in the most recent data that is greater than its screening level. Observations regarding

results of the Mann-Kendall test for trend for dissolved metals are noted in Table 2-7 and are summarized below:

- Arsenic concentrations exhibit a statistically significant downward trend in data from five shoreline wells, PL2-271A, PL2-425A, PL2443A, PL2-JF01AR, and PL2-JF02A and a statistically significant upward trend in data from one well, PL2-232A. The most recent arsenic data for samples from four of the six wells with statistically significant trends are at concentrations less than the arsenic background-adjusted screening level of 8.0 µg/L. The most recent arsenic concentrations in samples from wells PL2-271A and PL2-425A are greater than the background adjusted arsenic screening level of 8 µg/L.

- Cadmium concentrations did not exhibit statistically significant trends but the most recent cadmium concentration in the sample from PL2-013A is greater than its screening level of 8.8 µg/L.

- Chromium concentrations exhibit a statistically significant downward trend in the data from well PL2-443A. All of the most recent dissolved chromium concentrations in samples from shoreline wells are less than the screening level of 50 µg/L.

- Copper concentrations exhibit statistically significant downward trends in data from PL2-013A and PL2-607A and statistically significant upward trends in data from PL2-036AR, PL2-214B, and PL2-233A. The most recent copper concentrations in data from four of the five wells with a statistically significant trend are at concentrations less than the background-adjusted copper background level of 8.0 µg/L. The most recent copper concentration in the sample from PL2-013A is 23 µg/L, which is greater than the background-adjusted screening level of 8.0 µg/L.

- Lead concentrations did not exhibit statistically significant trends.

- Mercury concentrations exhibit a statistically significant downward trend in data from well PL2-013A. Mercury was not detected at a reporting limit of 0.02 µg/L in the most recent sample from PL2-013A.

- Nickel concentrations exhibit statistically significant downward trends in data from shoreline wells PL2-607A, PL2-015AR, PL2-232A, and PL2-443A. The most recent nickel concentrations for samples from all four wells with statistically significant trends are less than the nickel screening level of 8.2 µg/L.

- Zinc concentrations exhibit statistically significant upward trends in data from four shoreline wells, PL2-036AR, PL2-227A, PL2-232A, and PL2-443A. The most recent concentrations for the samples from three of the four wells are less than the zinc screening level of 81 µg/L. The most recent zinc concentration in the sample from PL2-036AR is 430 µg/L, which is greater than the screening level.

### 2.3.5 PCBs

Samples from shoreline monitoring wells PL2-036A and PL2-036AR were analyzed for low concentrations of seven PCB Aroclors. PCB Aroclor 1260 was detected in the sample from PL2-036A at a concentration of 0.019 µg/L, which is greater than the PCB screening level of 0.01 µg/L. PCB Aroclors were not detected in the sample from PL2-036AR. PCB results are presented in Attachment A.

Wells PL2-036A and PL2-036AR were selected for PCB analysis because PCBs were historically detected at low concentrations in well PL2-036A during the RFI. The PCB Aroclors detected during the RFI were Aroclor 1254 at an estimated (J-flagged) concentration of 0.48 µg/L and Aroclor 1260 at an estimated concentration of 0.85 µg/L.

## 2.4 Shoreline Groundwater Monitoring Sampling Schedule

The next shoreline groundwater monitoring well sampling event is scheduled for August 2010. In response to a letter from EPA to Boeing dated September 4, 2009, Boeing will continue to sample four additional C level wells, PL2-420C, PL2-425C, PL2-443C, and PL2-026C, for nickel and manganese analysis. Wells PL2-026C and PL2-425C are scheduled for decommissioning in 2010 in preparation for excavation required for construction of a duct bank. Therefore, these two wells might not exist during the August 2010 and subsequent sampling events.

## 3.0 REFERENCES

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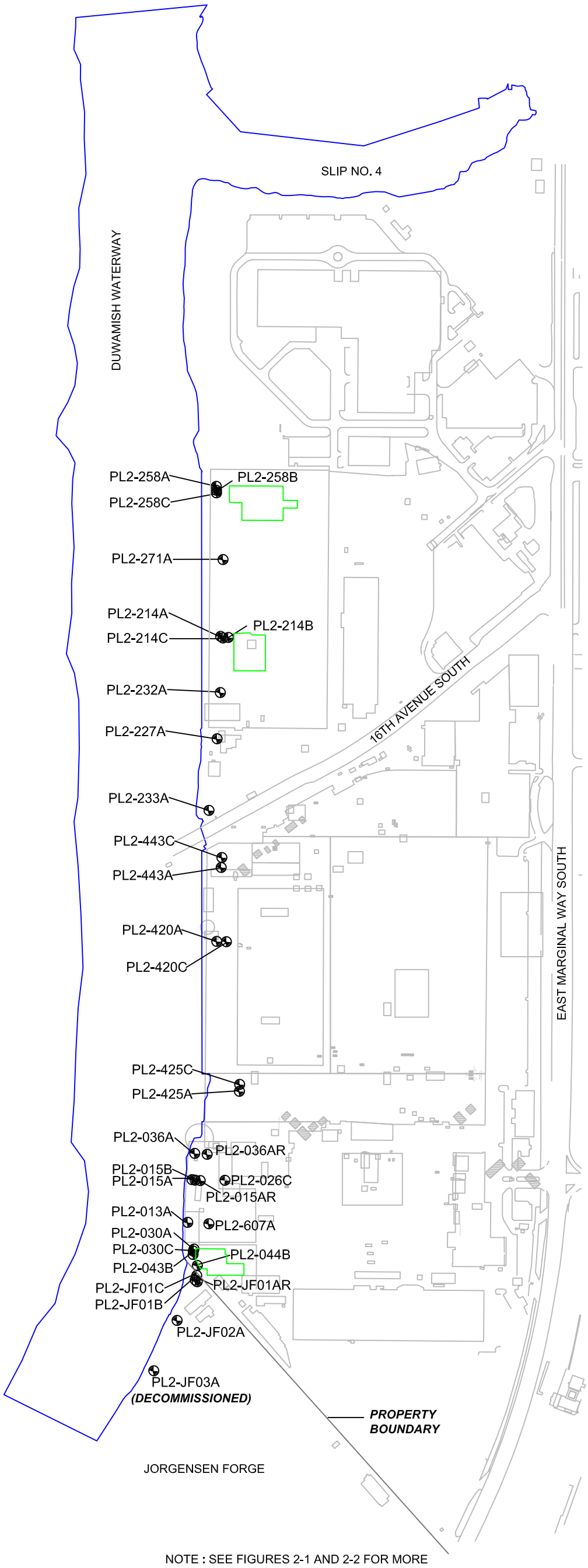
# Figures




NOTE : SEE FIGURES 2-1 AND 2-2 FOR MORE DETAILED WELL LOCATION MAPS

**PLANT 2 RCRA CORRECTIVE ACTION SHORELINE MONITORING SCHEDULE**

| Well Designation | Laboratory Analysis and Sampling Schedule | | | | | |
|---|---|---|---|---|---|---|
| | Volatile Organic Compounds | | Plant 2 Metals (total & dissolved) | | Mn, Ni (total & dissolved) | PCB |
| | Semi-annually | Annually | Semi-annually | Annually | Semi-annually | Semi-Annually |
| PL2-013A | X | | X | | | |
| PL2-607A | X | | X | | | |
| PL2-015A | X | | X | | | |
| PL2-015AR | X | | X | | | |
| PL2-015B | X | | X | | | |
| PL2-026C | | | | | X | |
| PL2-030A | X | | X | | | |
| PL2-030C | X | | | X | | |
| PL2-036A | X | | X | | | X |
| PL2-036AR | X | | X | | | X |
| PL2-043B | X | | X | | | |
| PL2-044B | X | | | X | | |
| PL2-214A | X | | X | | | |
| PL2-214B | X | | X | | | |
| PL2-214C | X | | | X | | |
| PL2-227A | | X | X | | | |
| PL2-232A | X | | X | | | |
| PL2-233A | X | | X | | | |
| PL2-258A | X | | X | | | |
| PL2-258B | X | | X | | | |
| PL2-258C | X | | | X | | |
| PL2-271A | X | | X | | | |
| PL2-420A | X | | | X | | |
| PL2-420C | | | | | X | |
| PL2-425A | X | | X | | | |
| PL2-425C | | | | | X | |
| PL2-443A | X | | X | | | |
| PL2-443C | | | | | X | |
| PL2-JF01AR | X | | X | | | |
| PL2-JF01B | X | | X | | | |
| PL2-JF01C | X | | | X | | |
| PL2-JF02A | X | | X | | | |
| PL2-JF03A | DECOMMISSIONED | | | | | |

Notes: Mn and Ni sampling in four C level wells added by USEPA letter dated 9/4/09

KEY:

SHORELINE MONITORING WELL

SHEETPILE STRUCTURE

0 100 200 400

SCALE: 1" = 400'

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FIGURE 1-1
SHORELINE MONITORING WELL LOCATIONS AND SAMPLING SCHEDULE

| | |
|---|---|
| PROJECT | BOEING PLANT 2 |
| PREPARED FOR | THE BOEING COMPANY |
| LOCATION | 7725 EAST MARGINAL WAY SEATTLE/TUKWILA, WASHINGTON |

| SHEET | DRAWN BY | REVIEWED BY | DATE |
|---|---|---|---|
| 1 of 1 | ARM | DCK | 04/13/10 |

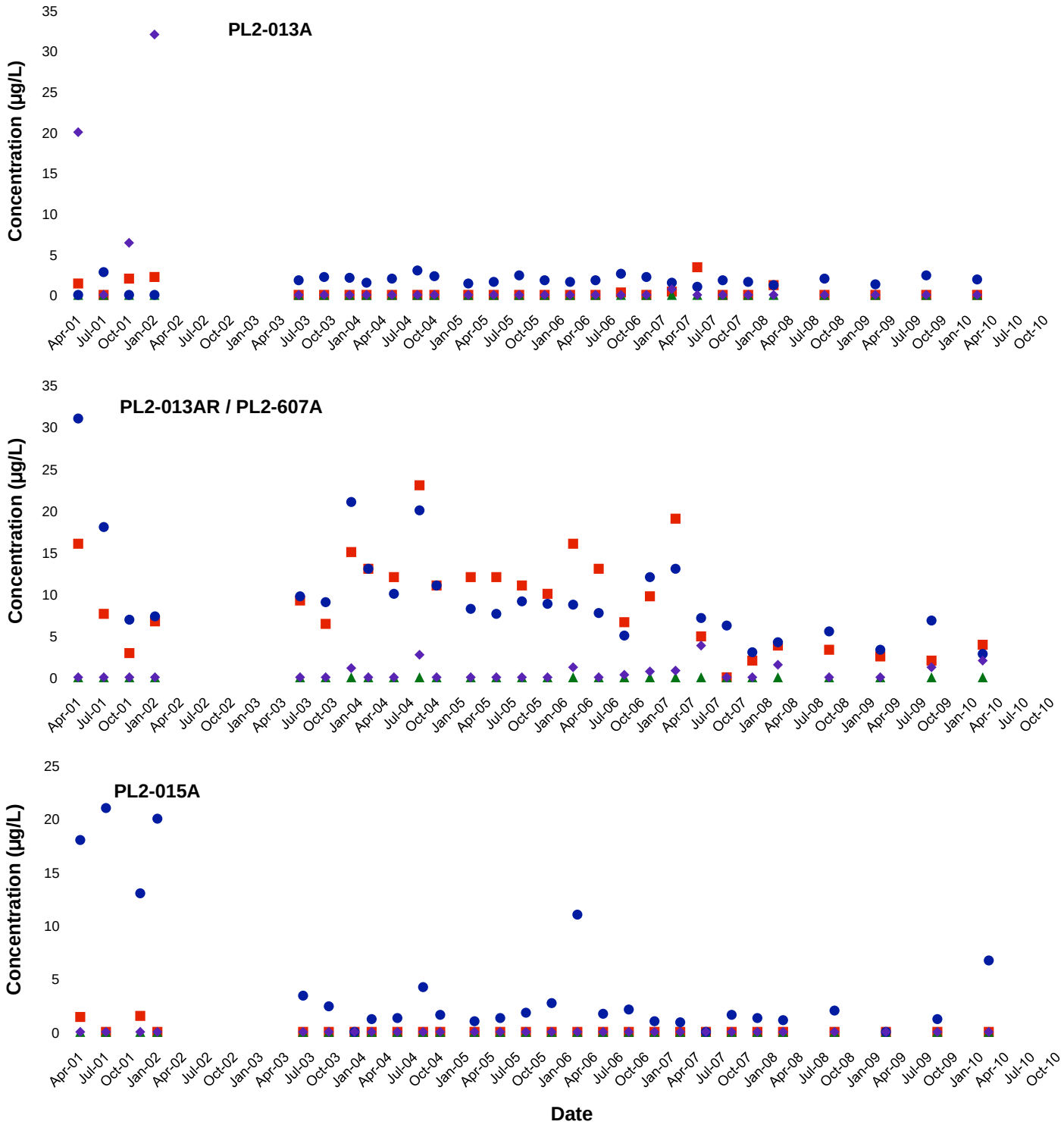


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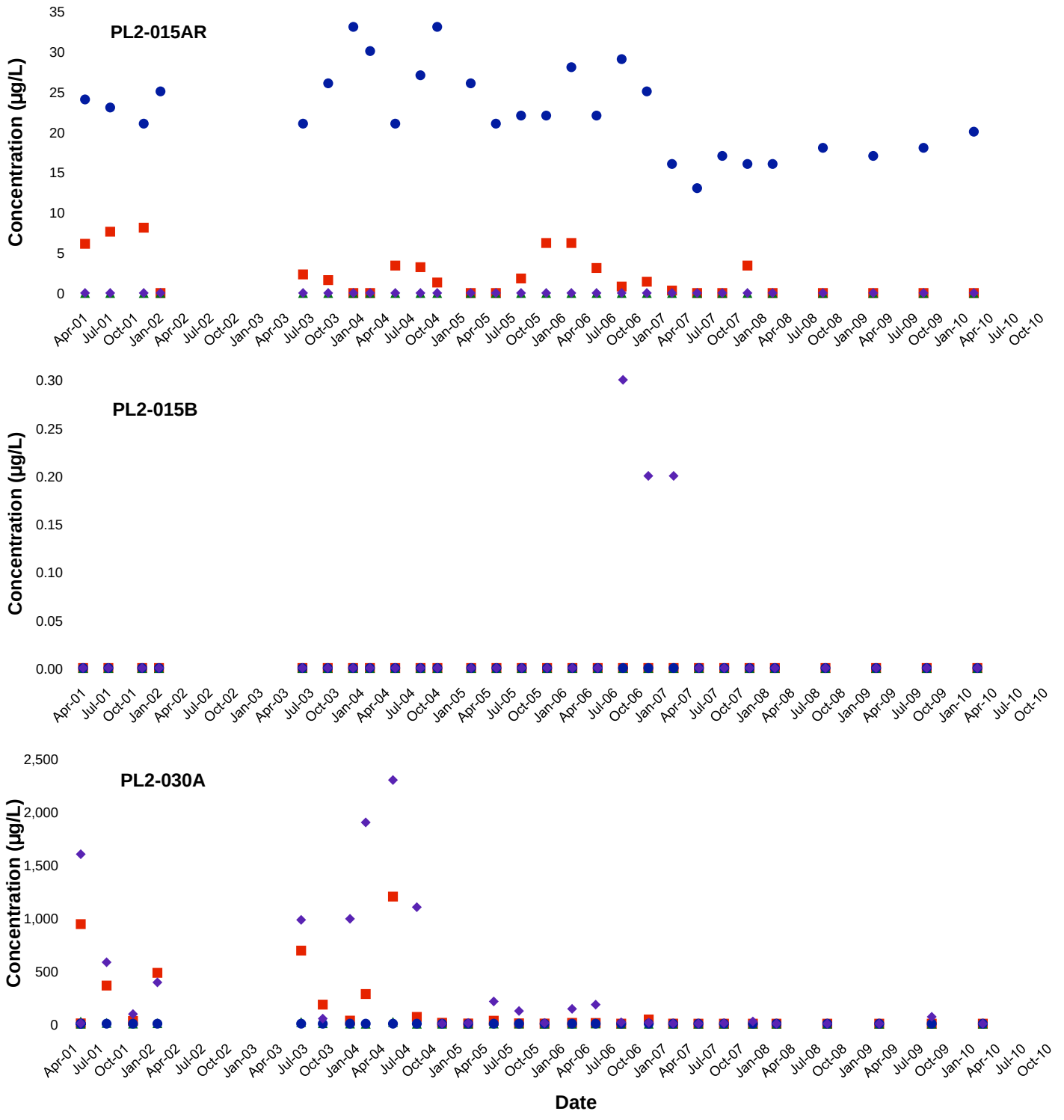
FIGURE 2-2a
CHLORINATED VOC TRENDS AT
PL2-013A, PL2-013AR, AND PL2-015A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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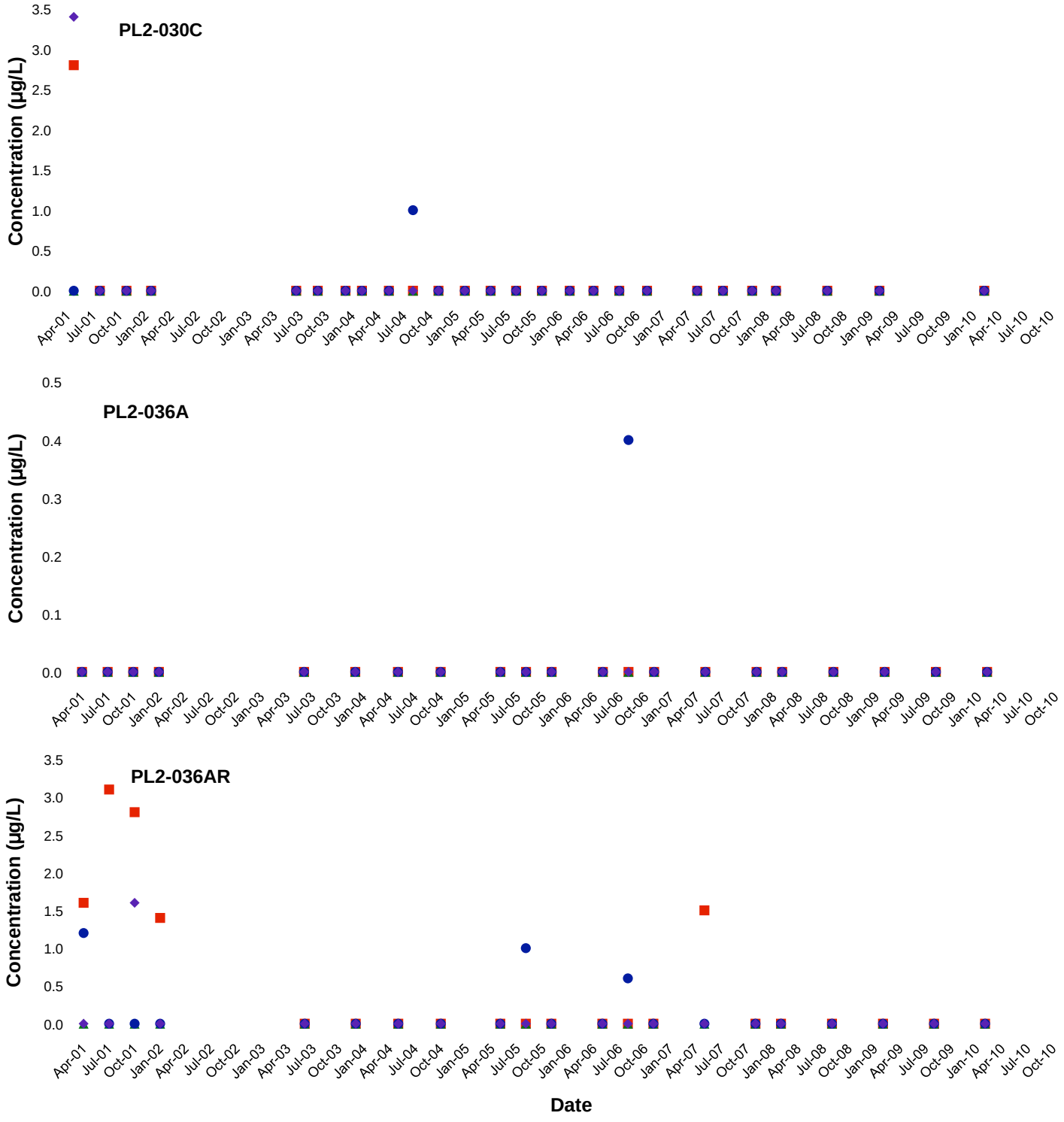
FIGURE 2-2b
CHLORINATED VOC TRENDS AT
PL2-015AR, PL2-015B, AND PL2-030A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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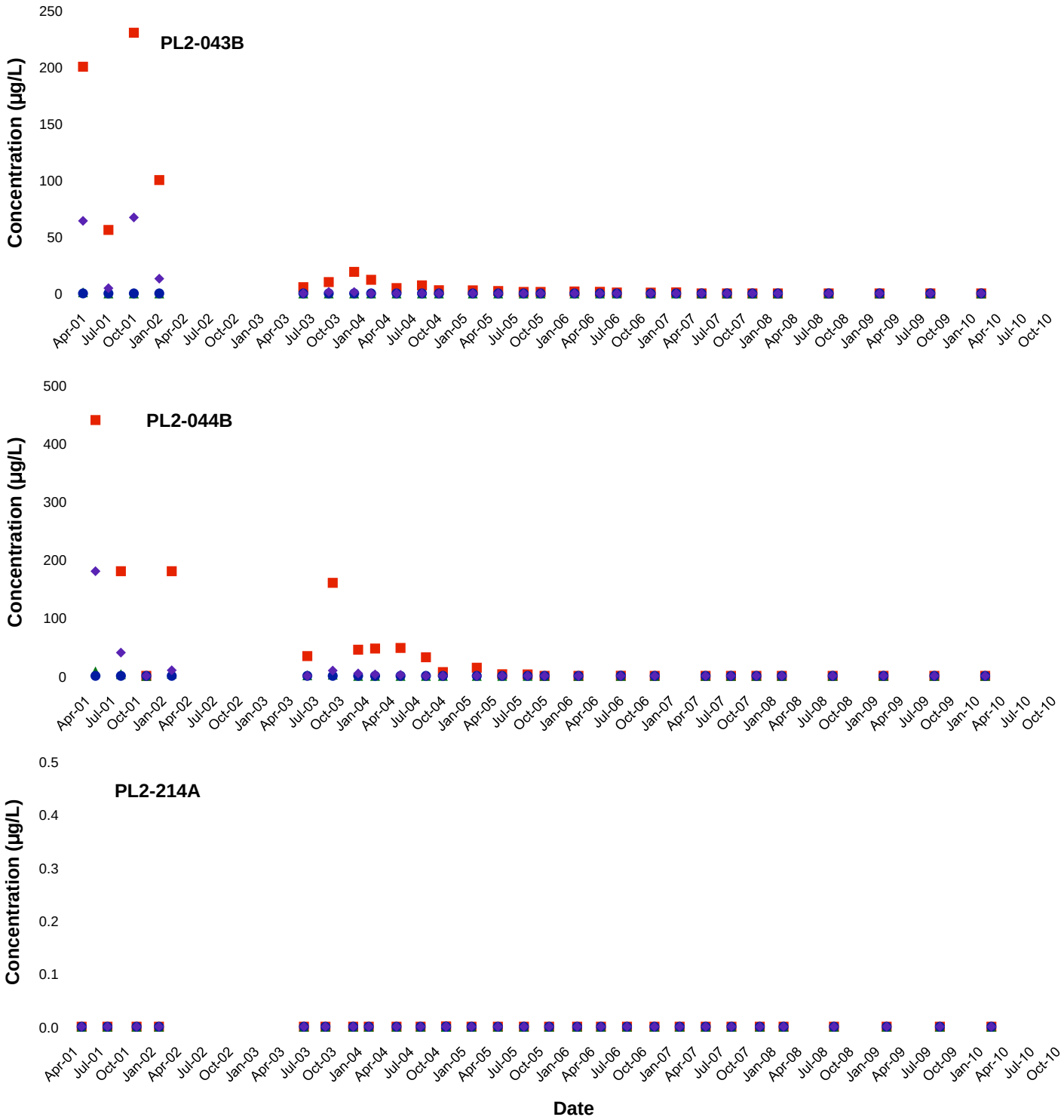
FIGURE 2-2c
CHLORINATED VOC TRENDS AT
PL2-030C, PL2-036A, AND PL2-036AR

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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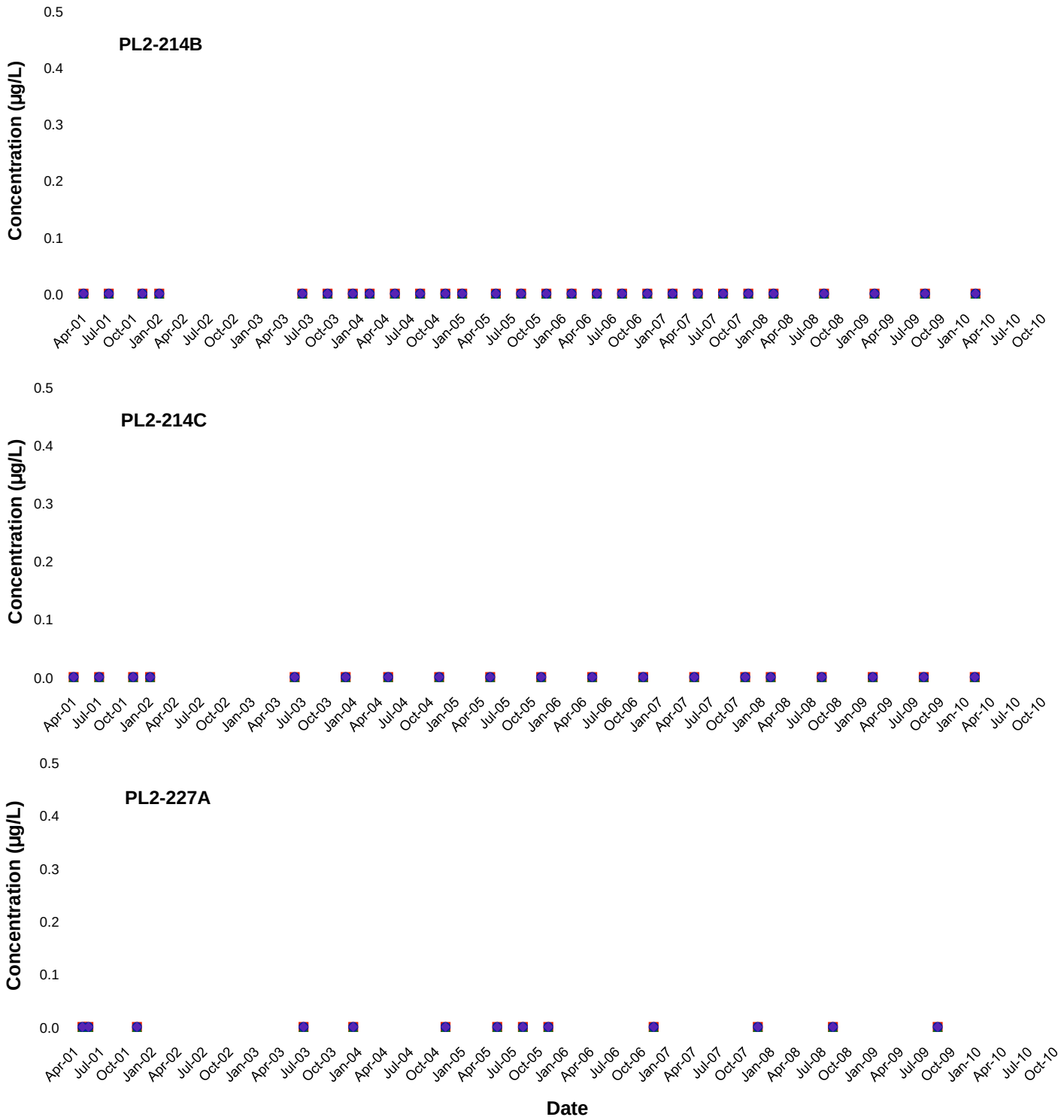
FIGURE 2-2d
CHLORINATED VOC TRENDS AT
PL2-043B, PL2-044B, AND PL2-214A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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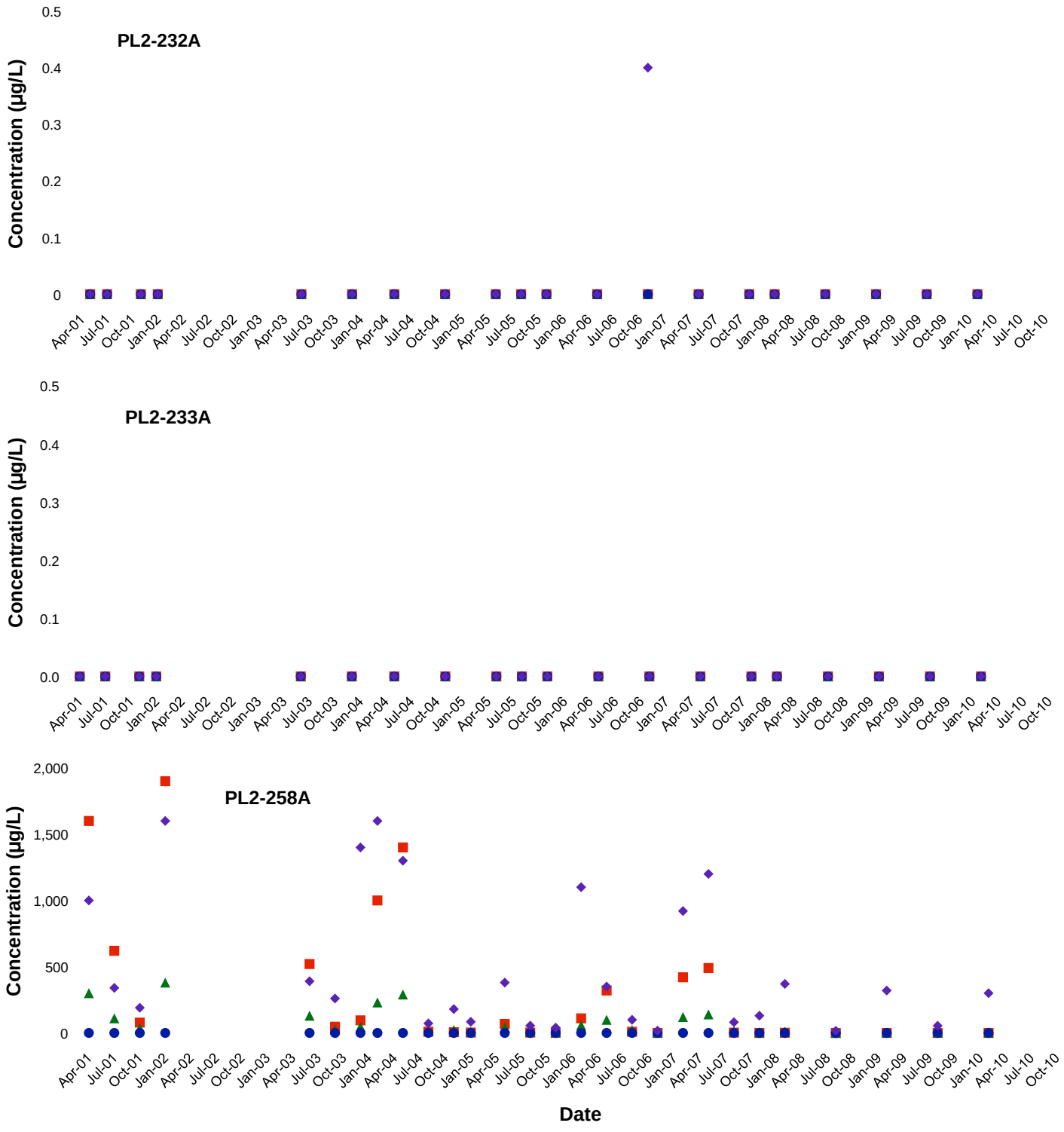
FIGURE 2-2e
CHLORINATED VOC TRENDS AT
PL2-214B, PL2-214C, AND PL2-227A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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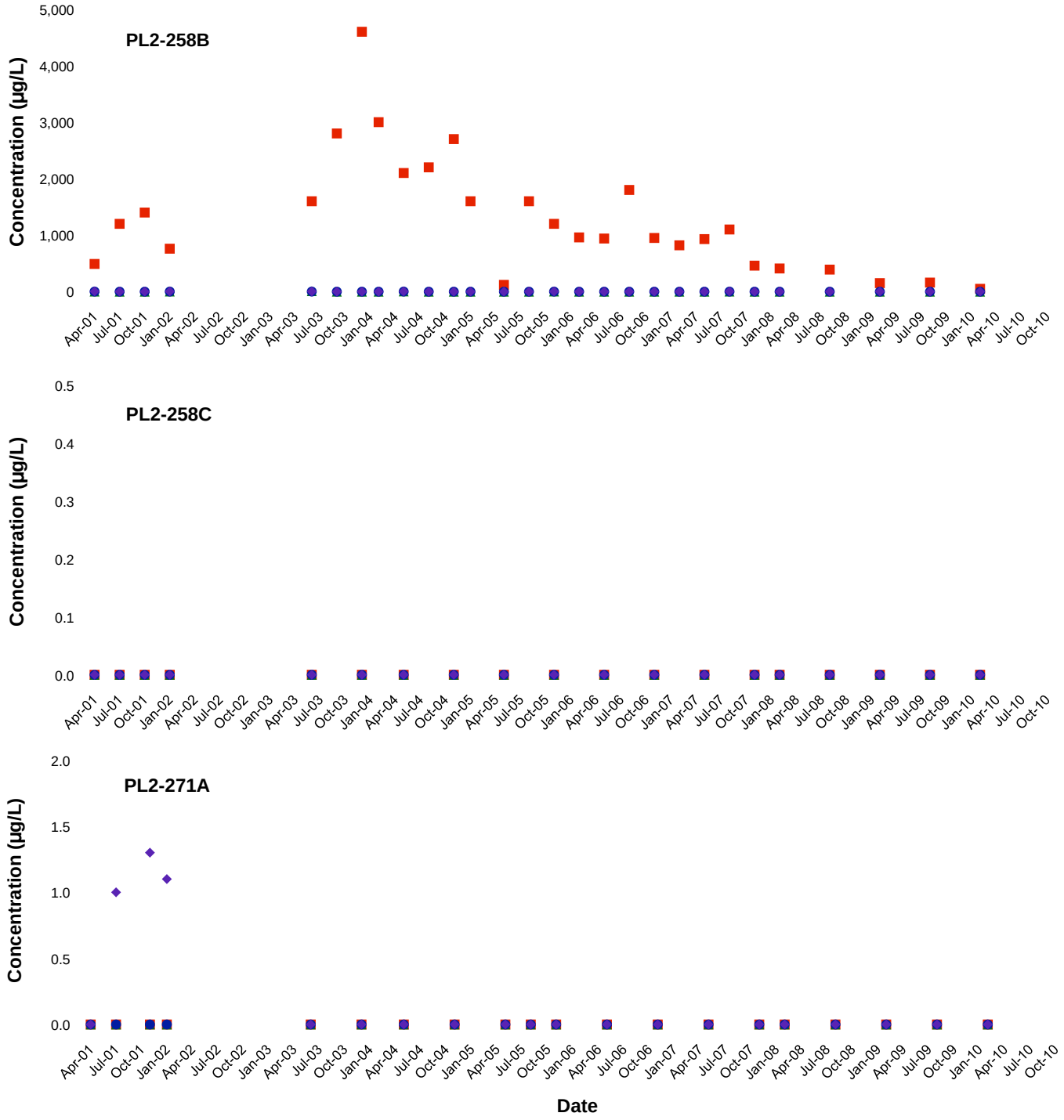
FIGURE 2-2f
CHLORINATED VOC TRENDS AT
PL2-232A, PL2-233A, AND PL2-258A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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FIGURE 2-2g
CHLORINATED VOC TRENDS AT
PL2-258B, PL2-258C, AND PL2-271A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

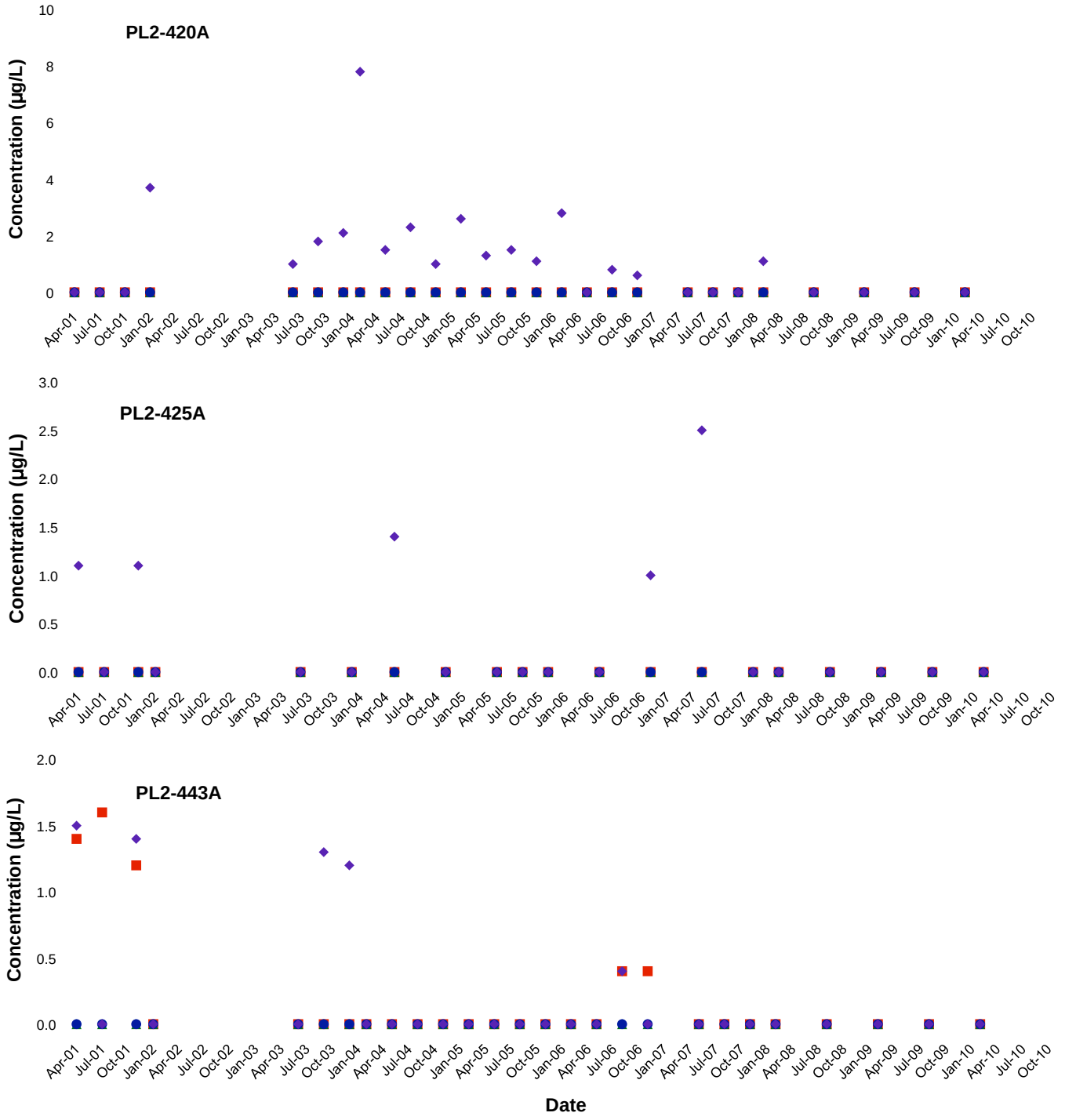


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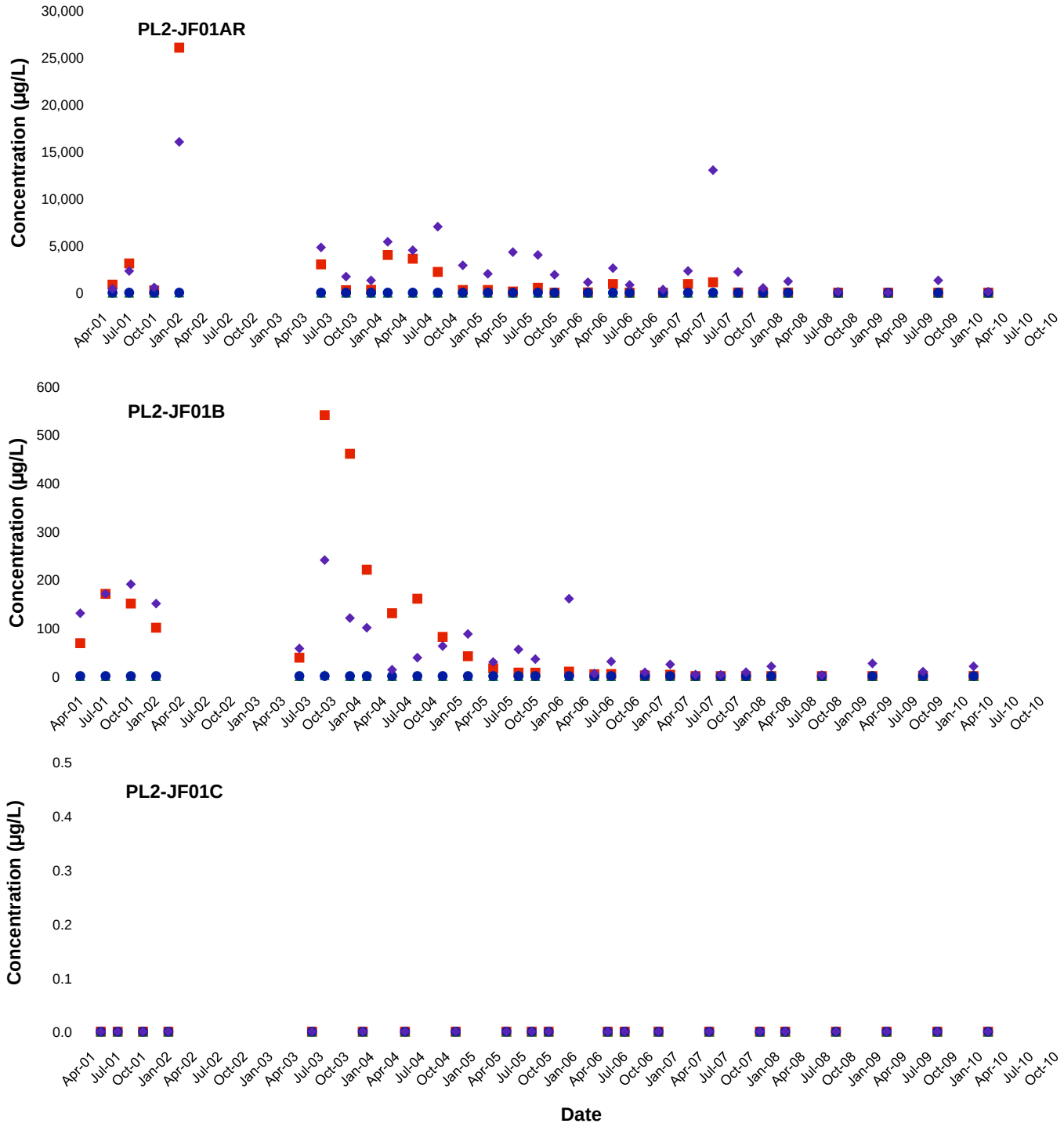
FIGURE 2-2h
CHLORINATED VOC TRENDS AT
PL2-420A, PL2-425A, AND PL2-443A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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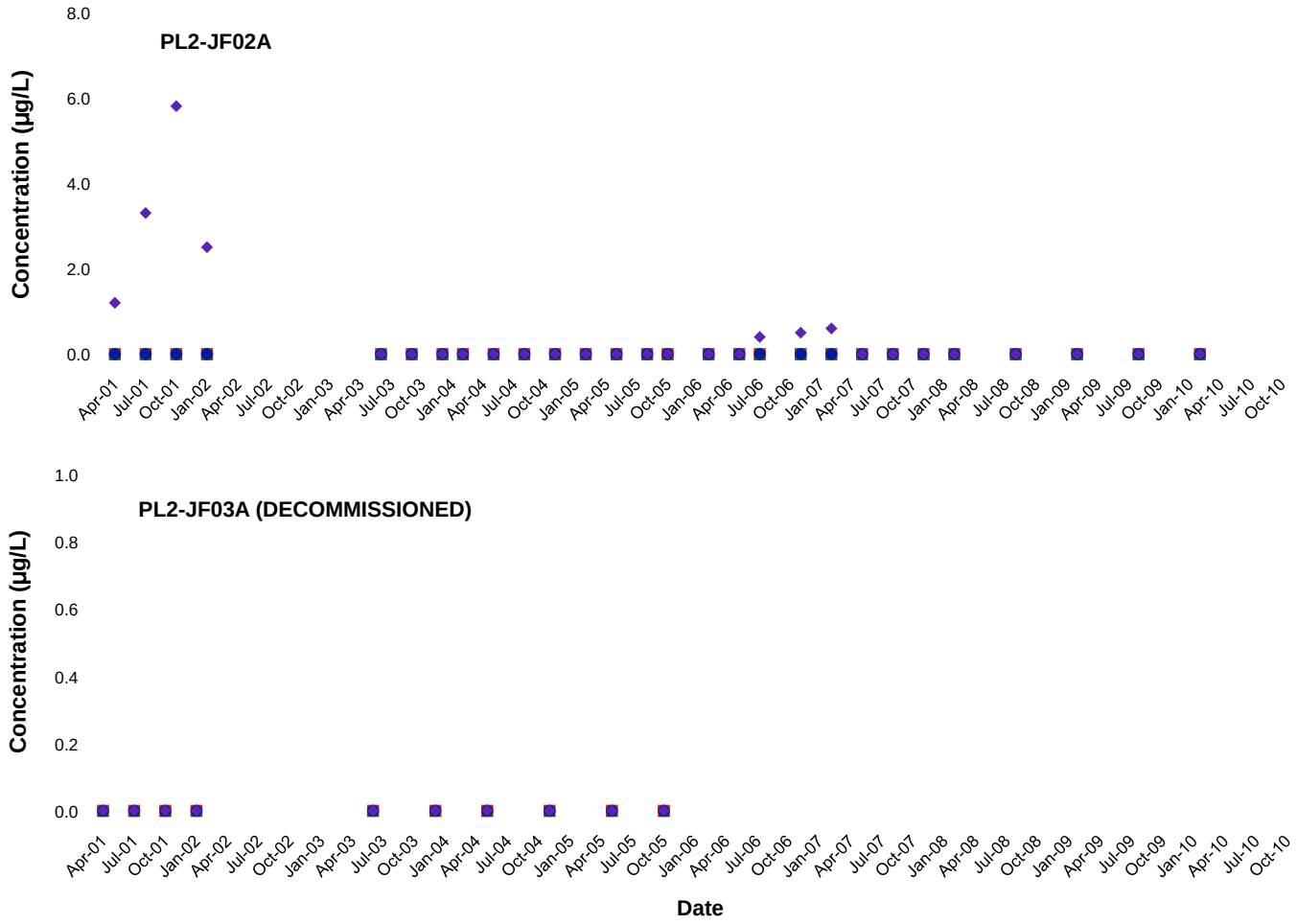
FIGURE 2-2i
CHLORINATED VOC TRENDS AT
PL2-JF01AR, PL2-JF01B, AND
PL2-JF01C

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

Drawn By DCK | Reviewed By DCK | Date 5/10




Legend

- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Trichloroethene
- Vinyl Chloride

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FIGURE 2-2j
CHLORINATED VOC TRENDS AT
PL2-JF02A AND PL2-JF03A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way<br>Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 9/09 |

| PL2-258A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 6.6 | 5.9 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.6 | 0.7 | UP < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 0.9 | 1.0 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 8.0 | 7.0 | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-258B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 1 U | 1 U | —— |
| As | 1 U | 1 U | NT < |
| Cd | 4 U | 4 U | NT < |
| Cr | 10 U | 10 U | NT < |
| Cu | 3.0 | 3.0 | NT < |
| Pb | 5 U | 5 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 7.0 | 7.0 | NT < |
| Ag | 1 U | 1 U | —— |
| V | 6 U | 6 U | —— |
| Zn | 20 U | 20 U | NT < |

| PL2-258C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT > |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT > |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | NA | NA | NT < |

| PL2-271A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 16.5 | 18.0 | DOWN > |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.5 U | 0.8 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 0.7 | 0.9 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 5.0 | 7.0 | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-214A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 7.5 | 0.7 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 1.4 | 0.5 U | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.0 | 0.6 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 6.0 | 5.0 | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-214B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 1 U | 1 U | —— |
| As | 1 U | 1.0 | NT < |
| Cd | 4 U | 4 U | NT < |
| Cr | 10 U | 10 U | NT < |
| Cu | 3.0 | 3.0 | UP < |
| Pb | 5 U | 5 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 9.0 | 8.0 | NT < |
| Ag | 1 U | 1 U | —— |
| V | 6 U | 6 U | —— |
| Zn | 20 U | 20 U | NT < |

| PL2-214C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT < |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT > |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | NA | NA | NT < |

| PL2-232A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/10/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 5.2 | 5.3 | UP < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 1.1 | 0.9 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 0.7 | 0.7 | DOWN < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 10 | 9.0 | —— |
| Zn | 10 U | 10 U | UP < |

| PL2-227A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 2.0 | 1.5 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 2.9 | 2.0 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.6 | 1.1 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 7.0 | 5.0 | —— |
| Zn | 10 U | 10 U | UP < |

PL2-258A
PL2-258B
PL2-258C
PL2-271A
PL2-214A
PL2-214B
PL2-214C
PL2-232A
PL2-227A
PL2-233A

BUILDING 2-10
BUILDING 2-15
BUILDING 2-31
16TH AVE S.
DUWAMISH WATERWAY

KEY:

SHEETPILE STRUCTURE

SHORELINE MONITORING WELL

| | | | |
|---|---|---|---|
| As | ARSENIC | Ni | NICKEL |
| Cd | CADMIUM | Zn | ZINC |
| Cr | CHROMIUM | Ag | SILVER |
| Cu | COPPER | Sb | ANTIMONY |
| V | VANADIUM | U | NON DETECT |
| Pb | LEAD | NA | NOT ANALYZED |
| Hg | MERCURY | | |

| | |
|---|---|
| NT | NO TREND |
| DOWN | DOWNWARD TREND |
| UP | UPWARD TREND |
| < | MOST RECENT DATA BELOW 2004 SCREENING LEVEL |
| > | MOST RECENT DATA ABOVE 2004 SCREENING LEVEL |

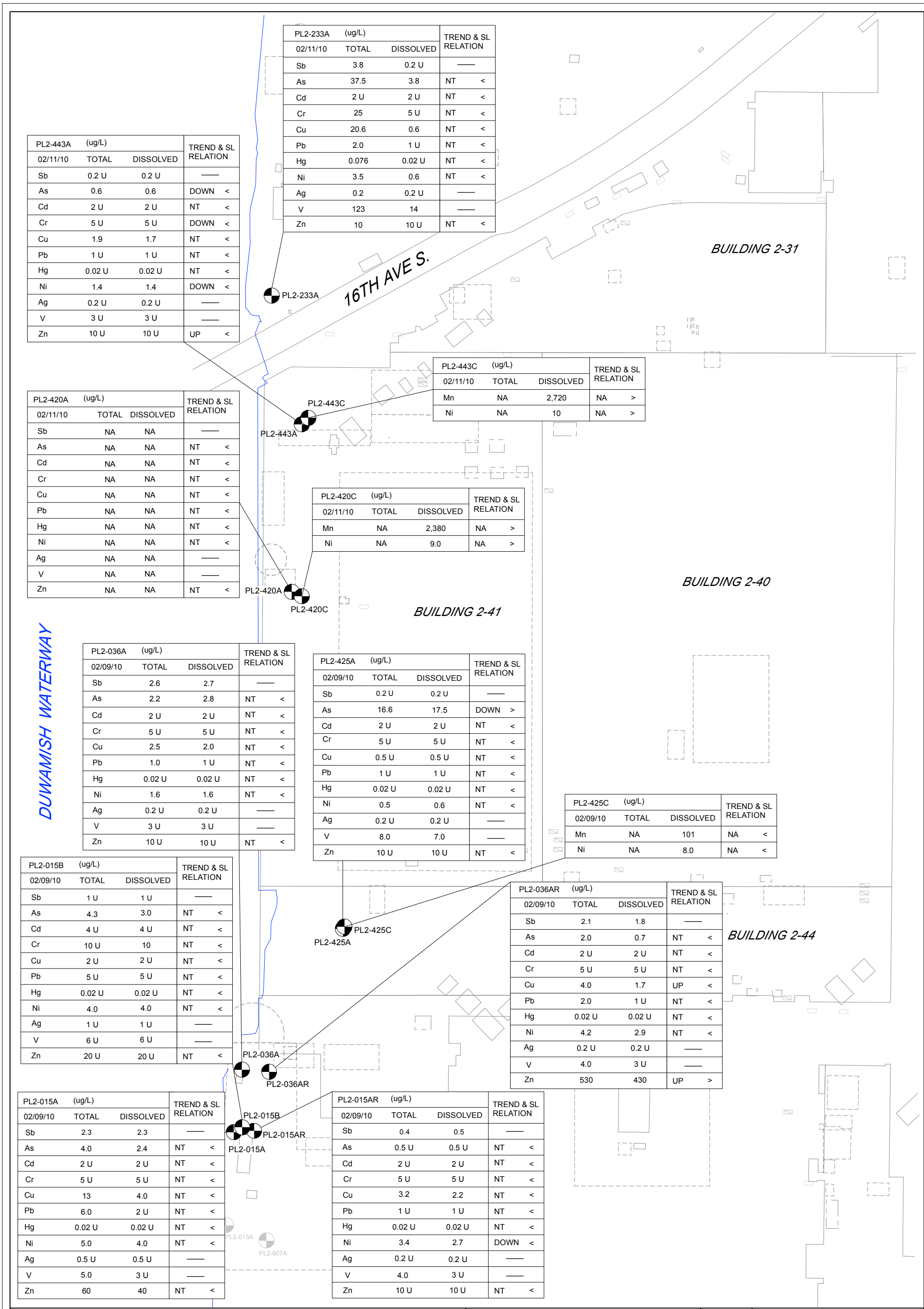
0 32.5 65 130

SCALE: 1" = 130'

ENVIRONMENTAL PARTNERS INC
295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 2-3a
FEBRUARY 2010 METALS RESULTS
SHORELINE MONITORING WELLS

| | | | | |
|---|---|---|---|---|
| PROJECT | BOEING PLANT 2 | | | |
| PREPARED FOR | THE BOEING COMPANY | | | |
| LOCATION | 7725 EAST MARGINAL WAY SEATTLE/TUKWILA, WASHINGTON | | | |
| SHEET | 1 of 1 | DRAWN BY | ARM | REVIEWED BY DCK | DATE 04/22/10 |




| PL2-233A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Sb | 3.8 | 0.2 U | —— |
| As | 37.5 | 3.8 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 25 | 5 U | NT < |
| Cu | 20.6 | 0.6 | NT < |
| Pb | 2.0 | 1 U | NT < |
| Hg | 0.076 | 0.02 U | NT < |
| Ni | 3.5 | 0.6 | NT < |
| Ag | 0.2 | 0.2 U | —— |
| V | 123 | 14 | —— |
| Zn | 10 | 10 U | NT < |

| PL2-443A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 0.6 | 0.6 | DOWN < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | DOWN < |
| Cu | 1.9 | 1.7 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.4 | 1.4 | DOWN < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 3 U | 3 U | —— |
| Zn | 10 U | 10 U | UP < |

| PL2-443C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Mn | NA | 2,720 | NA > |
| Ni | NA | 10 | NA > |

| PL2-420A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT < |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT < |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | NA | NA | NT < |

| PL2-420C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/11/10 | TOTAL | DISSOLVED | |
| Mn | NA | 2,380 | NA > |
| Ni | NA | 9.0 | NA > |

| PL2-036A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 2.6 | 2.7 | —— |
| As | 2.2 | 2.8 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 2.5 | 2.0 | NT < |
| Pb | 1.0 | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.6 | 1.6 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 3 U | 3 U | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-425A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 16.6 | 17.5 | DOWN > |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.5 U | 0.5 U | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 0.5 | 0.6 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 8.0 | 7.0 | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-425C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Mn | NA | 101 | NA < |
| Ni | NA | 8.0 | NA < |

| PL2-036AR | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 2.1 | 1.8 | —— |
| As | 2.0 | 0.7 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 4.0 | 1.7 | UP < |
| Pb | 2.0 | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 4.2 | 2.9 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 4.0 | 3 U | —— |
| Zn | 530 | 430 | UP > |

| PL2-015B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 1 U | 1 U | —— |
| As | 4.3 | 3.0 | NT < |
| Cd | 4 U | 4 U | NT < |
| Cr | 10 U | 10 | NT < |
| Cu | 2 U | 2 U | NT < |
| Pb | 5 U | 5 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 4.0 | 4.0 | NT < |
| Ag | 1 U | 1 U | —— |
| V | 6 U | 6 U | —— |
| Zn | 20 U | 20 U | NT < |

| PL2-015A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 2.3 | 2.3 | —— |
| As | 4.0 | 2.4 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 13 | 4.0 | NT < |
| Pb | 6.0 | 2 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 5.0 | 4.0 | NT < |
| Ag | 0.5 U | 0.5 U | —— |
| V | 5.0 | 3 U | —— |
| Zn | 60 | 40 | NT < |

| PL2-015AR | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/09/10 | TOTAL | DISSOLVED | |
| Sb | 0.4 | 0.5 | —— |
| As | 0.5 U | 0.5 U | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 3.2 | 2.2 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 3.4 | 2.7 | DOWN < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 4.0 | 3 U | —— |
| Zn | 10 U | 10 U | NT < |

KEY:

SHEETPILE STRUCTURE

SHORELINE MONITORING WELL

| | | | |
|---|---|---|---|
| As | ARSENIC | Ni | NICKEL |
| Cd | CADMIUM | Zn | ZINC |
| Cr | CHROMIUM | Ag | SILVER |
| Cu | COPPER | Sb | ANTIMONY |
| V | VANADIUM | U | NON DETECT |
| Pb | LEAD | NA | NOT ANALYZED |
| Hg | MERCURY | | |

| | |
|---|---|
| NT | NO TREND |
| DOWN | DOWNWARD TREND |
| UP | UPWARD TREND |
| < | MOST RECENT DATA BELOW 2004 SCREENING LEVEL |
| > | MOST RECENT DATA ABOVE 2004 SCREENING LEVEL |

0 37.5 75 150

SCALE: 1" = 150"

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295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 2-3b
FEBRUARY 2010 METALS RESULTS
SHORELINE MONITORING WELLS

| | |
|---|---|
| PROJECT | BOEING PLANT 2 |
| PREPARED FOR | THE BOEING COMPANY |
| LOCATION | 7725 EAST MARGINAL WAY SEATTLE/TUKWILA, WASHINGTON |

| SHEET | DRAWN BY | REVIEWED BY | DATE |
|---|---|---|---|
| 1 of 1 | ARM | DCK | 04/22/10 |

DUWAMISH WATERWAY

# BOEING PLANT 2

BUILDING 2-49

| PL2-013A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 6.3 | 6.1 | —— |
| As | 1.7 | 1.5 | NT < |
| Cd | 38 | 37 | NT > |
| Cr | 5 U | 5 U | NT < |
| Cu | 30 | 23 | DOWN > |
| Pb | 4.0 | 2 U | NT < |
| Hg | 0.02 U | 0.02 U | DOWN < |
| Ni | 35 | 33 | NT > |
| Ag | 10.2 | 9.1 | —— |
| V | 3 U | 4.0 | —— |
| Zn | 1,320 | 1,250 | NT > |

| PL2-026C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Mn | NA | 739 | NA < |
| Ni | NA | 9 | NA > |

| PL2-607A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 3.6 | 3.4 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.5 U | 0.9 | DOWN < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.7 | 1.5 | DOWN < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 3 U | 3 U | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-030A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 1.1 | 1.2 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5.0 | 5 U | NT < |
| Cu | 1.8 | 1.0 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 3.0 | 2.2 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 3.0 | 3 U | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-044B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT < |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT < |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | NA | NA | NT < |

| PL2-030C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT < |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT < |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | NA | NA | NT < |

| PL2-JF01AR | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 0.6 | 0.7 | DOWN < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.7 | 0.5 | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.0 | 2.0 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 11 | 11 | —— |
| Zn | 10 | 10 U | NT < |

| PL2-JF01B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 0.5 U | 0.5 U | —— |
| As | 2.0 | 2.0 | NT < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 1.0 | 1 U | NT < |
| Pb | 2 U | 2 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 2.0 | 2.0 | NT < |
| Ag | 0.5 U | 0.5 U | —— |
| V | 6.0 | 5.0 | —— |
| Zn | 10 U | 10 U | NT < |

| PL2-JF01C | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | NA | NA | —— |
| As | NA | NA | NT < |
| Cd | NA | NA | NT < |
| Cr | NA | NA | NT < |
| Cu | NA | NA | NT < |
| Pb | NA | NA | NT < |
| Hg | NA | NA | NT < |
| Ni | NA | NA | NT < |
| Ag | NA | NA | —— |
| V | NA | NA | —— |
| Zn | 20 U | NA | NT < |

| PL2-043B | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 1 U | 1 U | —— |
| As | 2 U | 6.0 | NT < |
| Cd | 10 U | 10 U | NT < |
| Cr | 20 U | 20 U | NT < |
| Cu | 2 U | 3.0 | NT < |
| Pb | 5 U | 5 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 8.0 | 10 | NT > |
| Ag | 1 U | 1 U | —— |
| V | 20 U | 20 U | —— |
| Zn | 50 U | 50 U | NT < |

| PL2-JF02A | (ug/L) | | TREND & SL RELATION |
|---|---|---|---|
| 02/08/10 | TOTAL | DISSOLVED | |
| Sb | 0.2 U | 0.2 U | —— |
| As | 0.7 | 0.4 | DOWN < |
| Cd | 2 U | 2 U | NT < |
| Cr | 5 U | 5 U | NT < |
| Cu | 0.8 | 0.5 U | NT < |
| Pb | 1 U | 1 U | NT < |
| Hg | 0.02 U | 0.02 U | NT < |
| Ni | 1.6 | 1.1 | NT < |
| Ag | 0.2 U | 0.2 U | —— |
| V | 7.0 | 6.0 | —— |
| Zn | 10 U | 10 U | NT < |

PL2-036AR
PL2-036A
PL2-015AR
PL2-026C
PL2-013A
PL2-607A
PL2-030A
PL2-030C
PL2-043B
PL2-044B
PL2-JF01AR
PL2-JF01C
PL2-JF01B
PL2-JF02A
PL2-JF03A (DECOMMISSIONED)

*Building 2-66 Sheetpile*

BUILDING 2-81

**PROPERTY BOUNDARY**

JORGENSEN FORGE

KEY:

SHEETPILE STRUCTURE

SHORELINE MONITORING WELL

| | | | |
|---|---|---|---|
| As | ARSENIC | Ni | NICKEL |
| Cd | CADMIUM | Zn | ZINC |
| Cr | CHROMIUM | Ag | SILVER |
| Cu | COPPER | Sb | ANTIMONY |
| V | VANADIUM | U | NON DETECT |
| Pb | LEAD | NA | NOT ANALYZED |
| Hg | MERCURY | | |

| | |
|---|---|
| NT | NO TREND |
| DOWN | DOWNWARD TREND |
| UP | UPWARD TREND |
| < | MOST RECENT DATA BELOW 2004 SCREENING LEVEL |
| > | MOST RECENT DATA ABOVE 2004 SCREENING LEVEL |

0 20 40 80

SCALE: 1" = 80'

ENVIRONMENTAL PARTNERS INC
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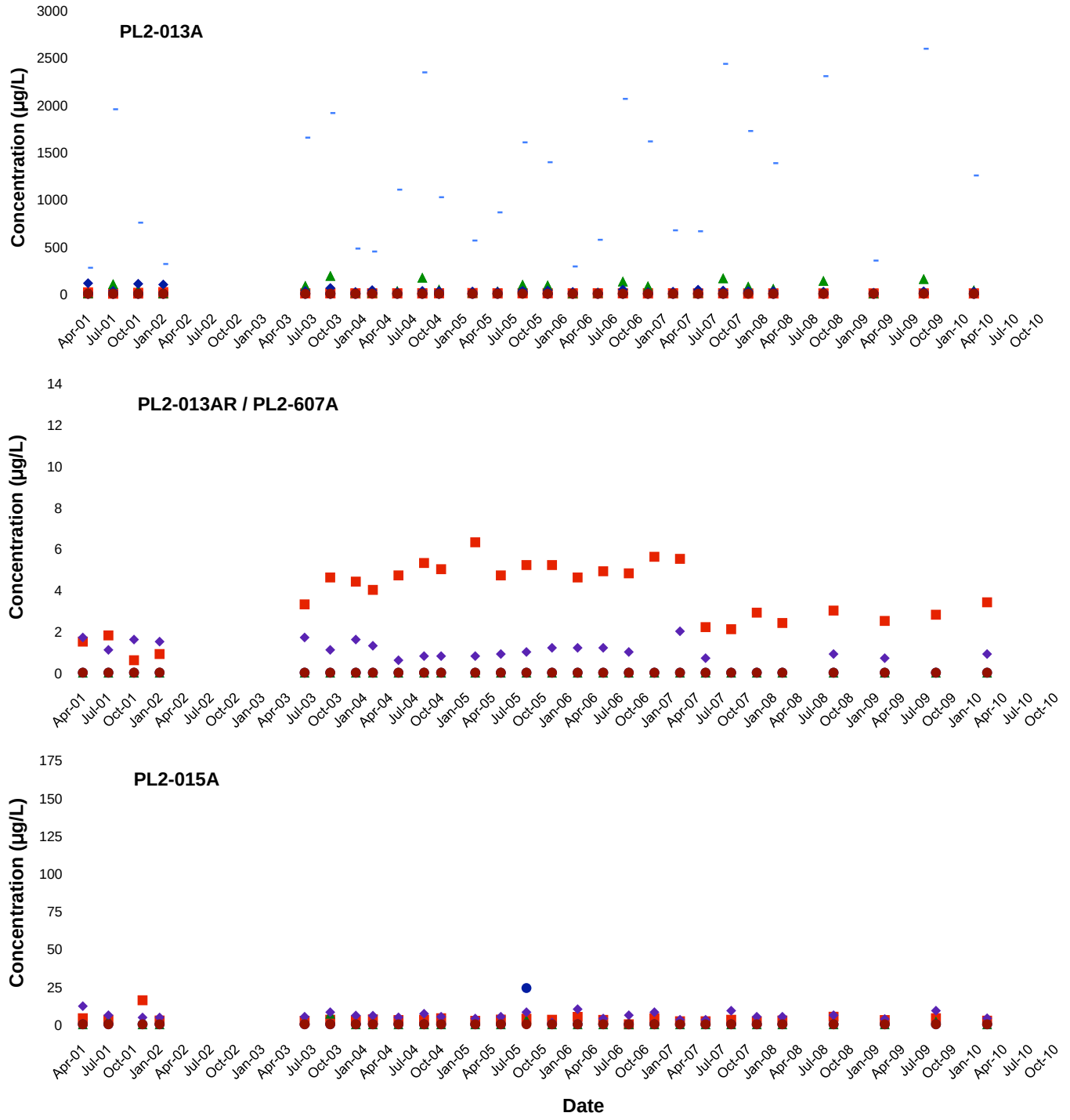
Issaquah, Washington 98027

FIGURE 2-3c
FEBRUARY 2010 METALS RESULTS
SHORELINE MONITORING WELLS

| | |
|---|---|
| PROJECT | BOEING PLANT 2 |
| PREPARED FOR | THE BOEING COMPANY |
| LOCATION | 7725 EAST MARGINAL WAY SEATTLE/TUKWILA, WASHINGTON |

| SHEET | DRAWN BY | REVIEWED BY | DATE |
|---|---|---|---|
| 1 of 1 | ARM | DCK | 04/22/10 |




Legend

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

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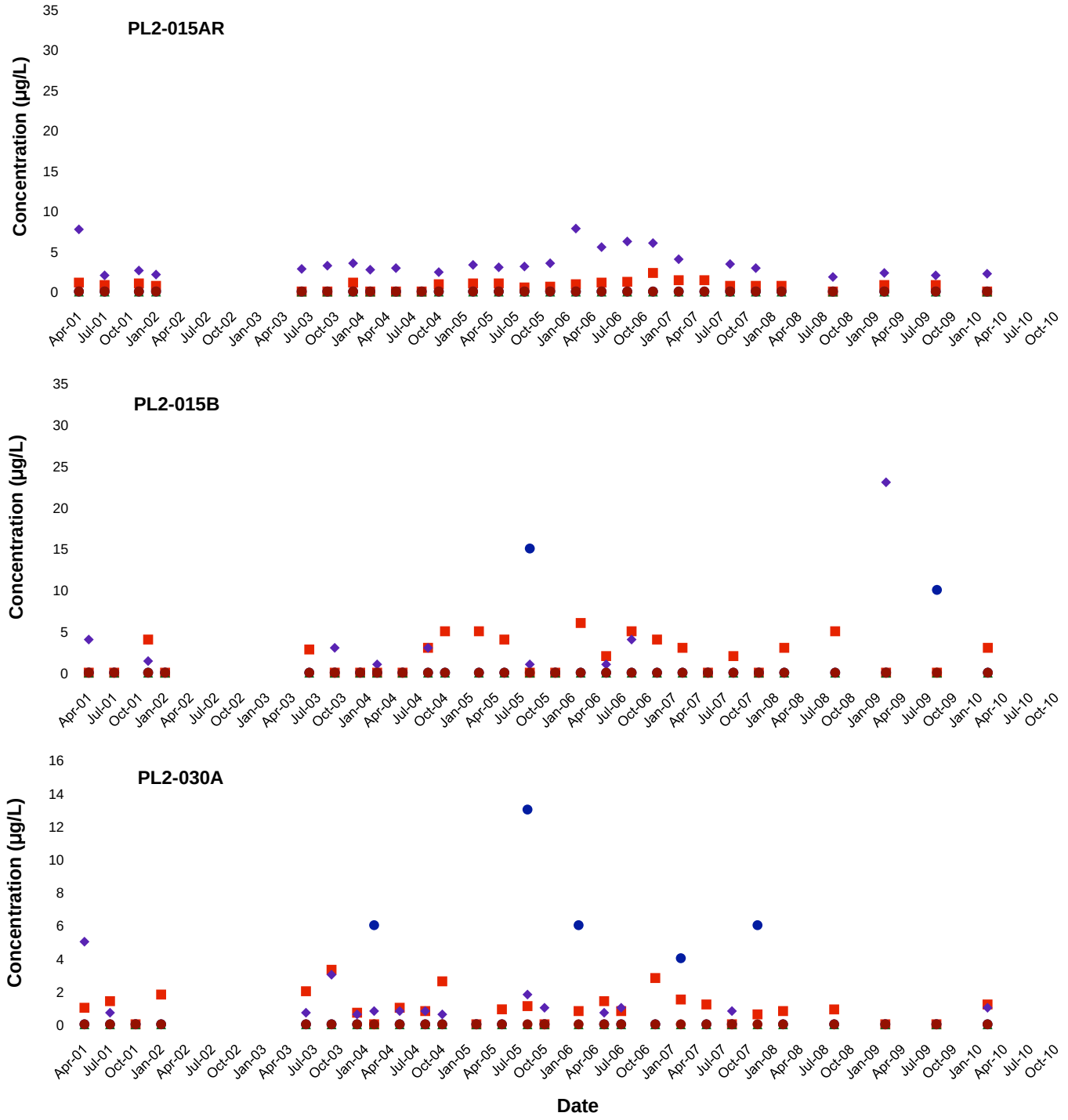
Issaquah, Washington 98027

FIGURE 2-4a
DISSOLVED METALS TRENDS AT
PL2-013A, PL2-013AR, AND PL2-015A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

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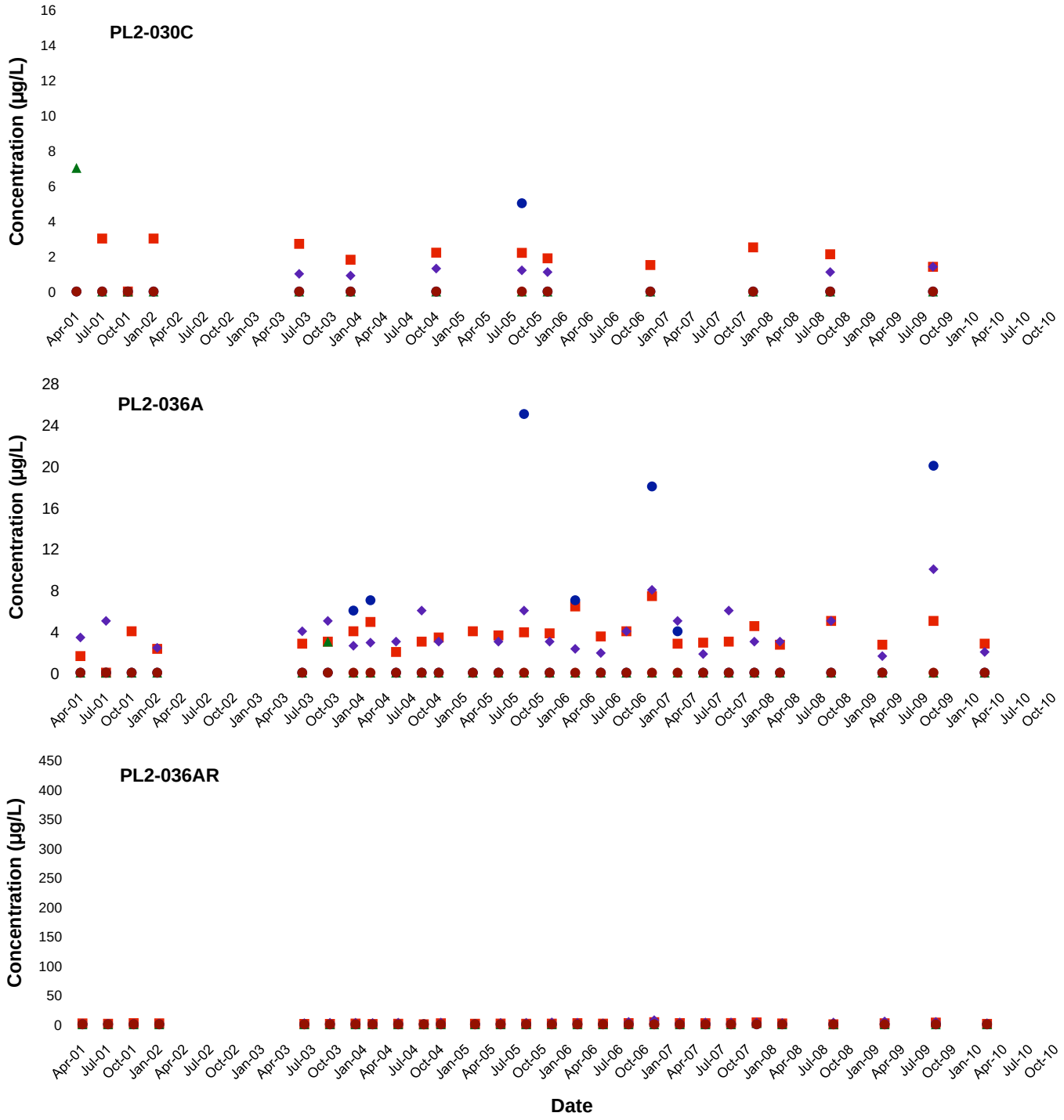
Issaquah, Washington 98027

FIGURE 2-4b
DISSOLVED METALS TRENDS AT
PL2-015AR, PL2-015B, AND PL2-030A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

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FIGURE 2-4c
DISSOLVED METAL TRENDS AT
PL2-030C, PL2-036A, AND PL2-036AR

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

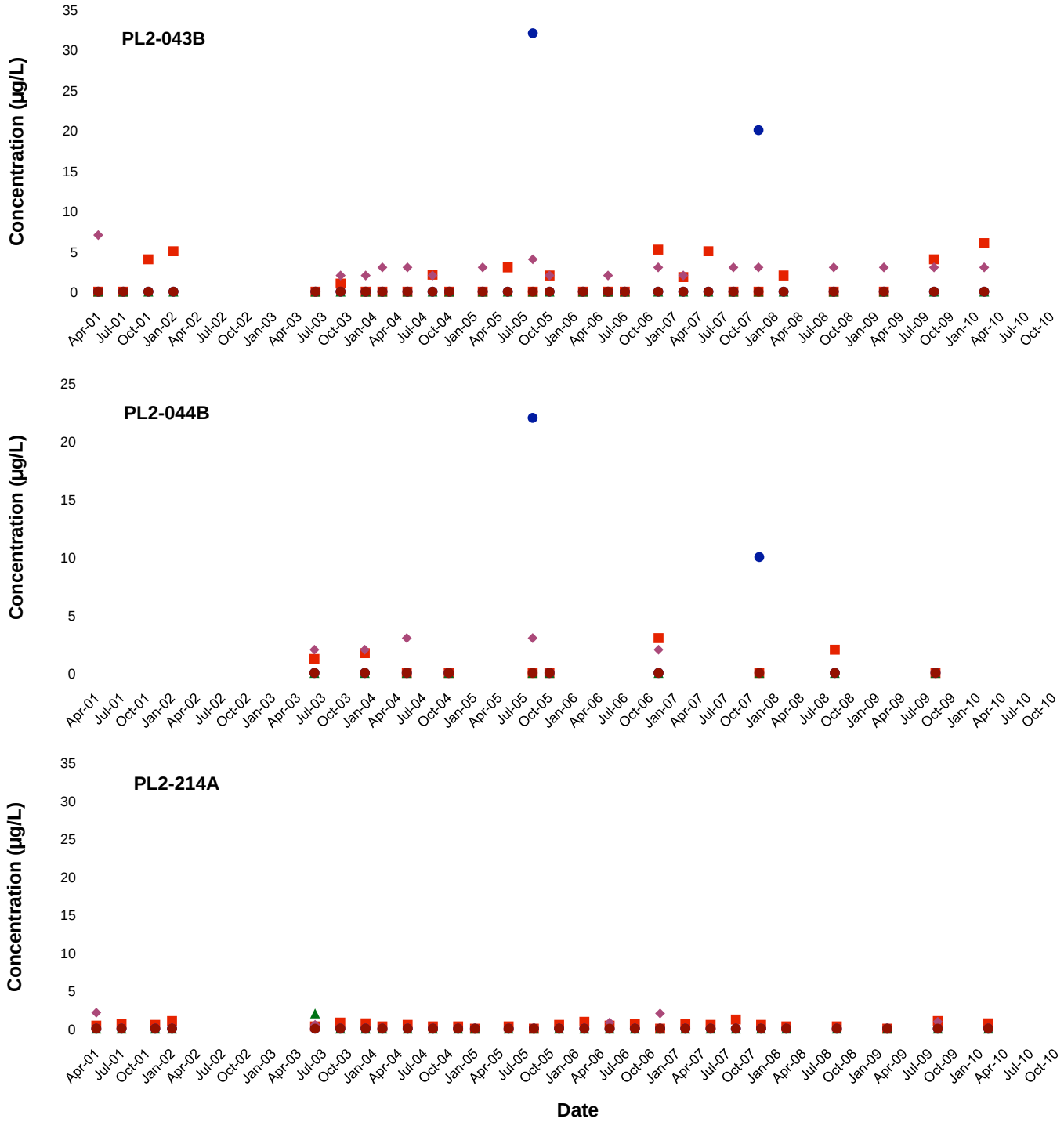


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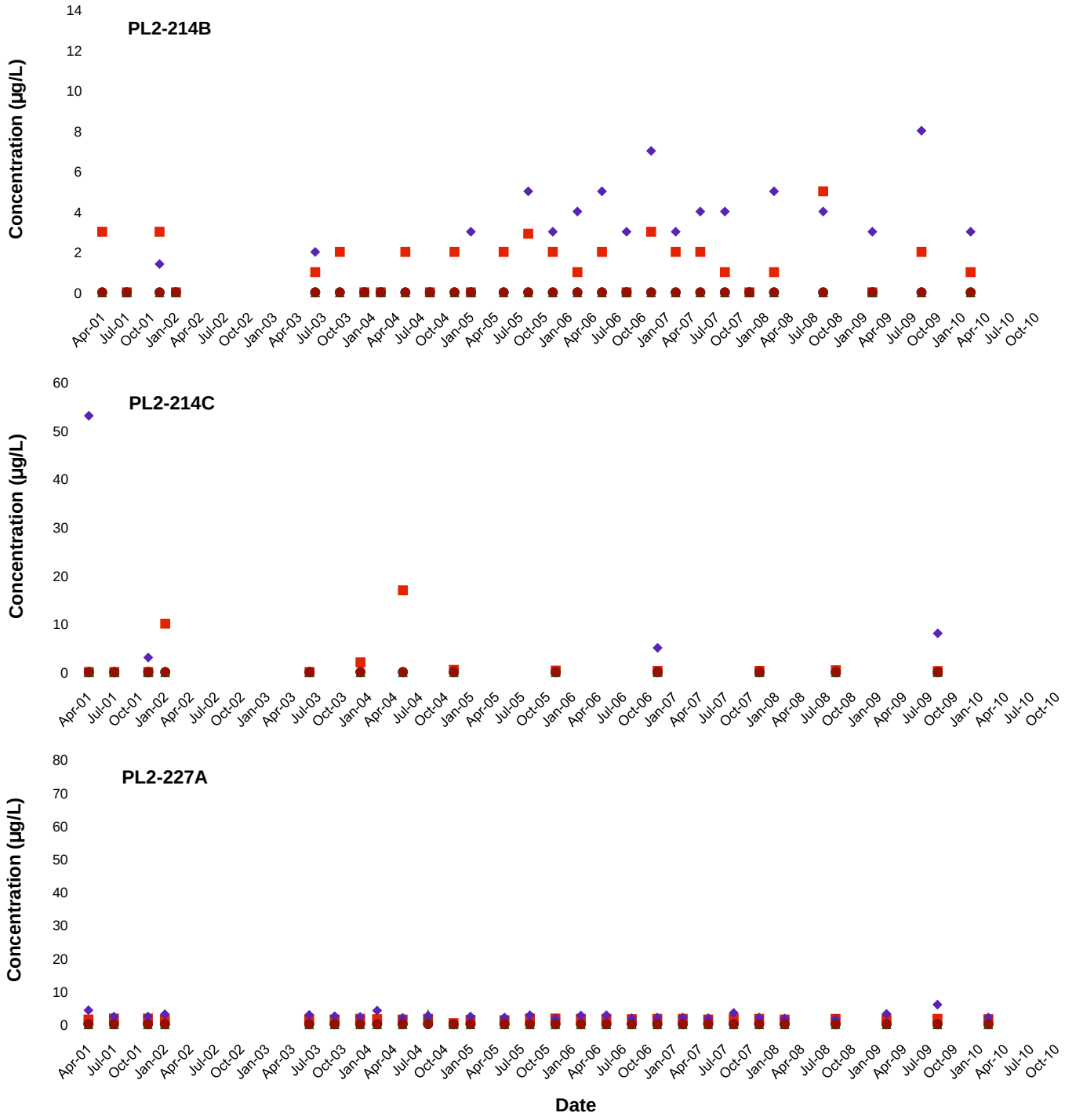
FIGURE 2-4d
DISSOLVED METALS TRENDS AT
PL2-043B, PL2-044B, AND PL2-214A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

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Issaquah, Washington 98027

FIGURE 2-4e
DISSOLVED METALS TRENDS AT
PL2-214B, PL2-214C, AND PL2-227A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

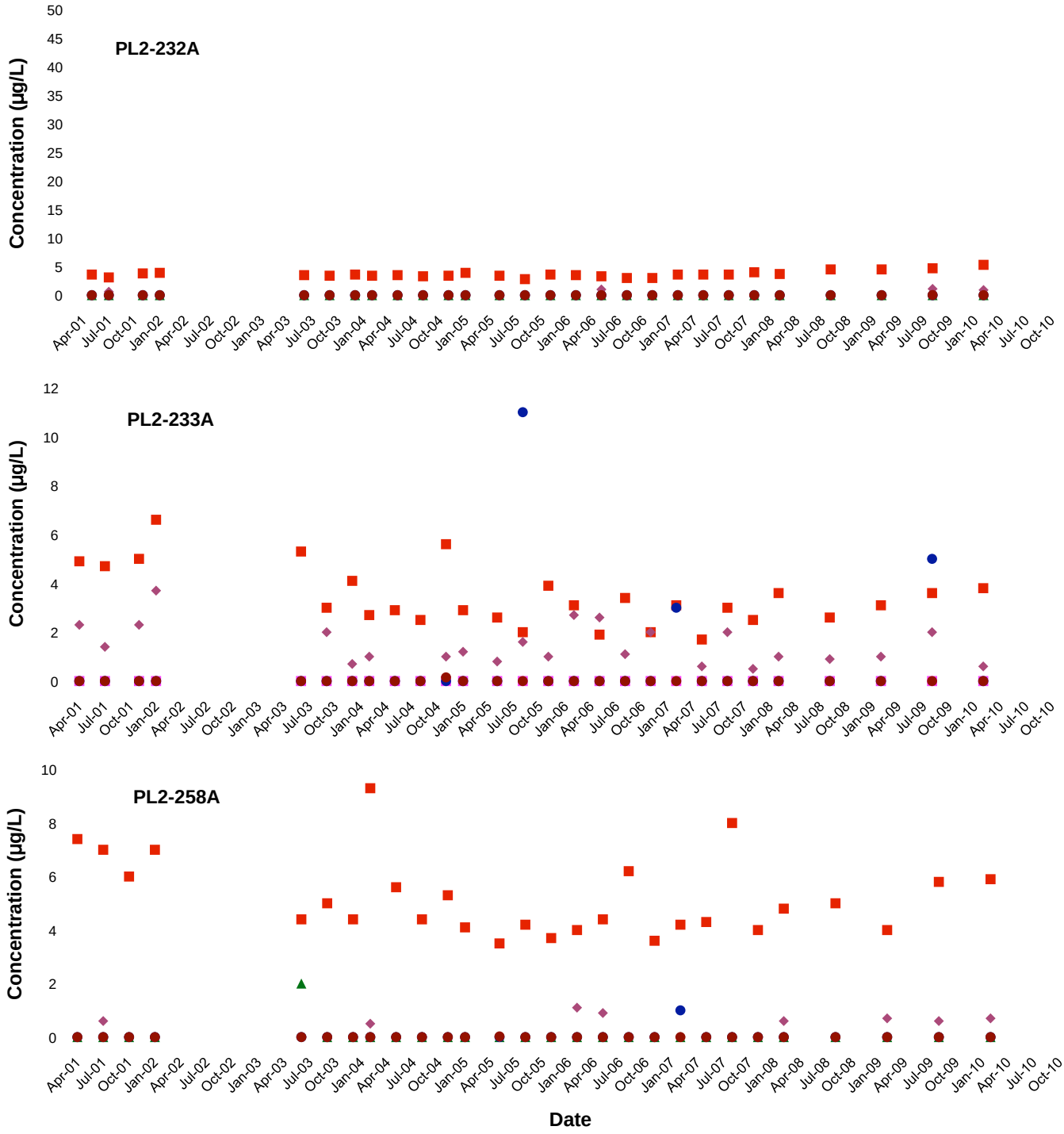


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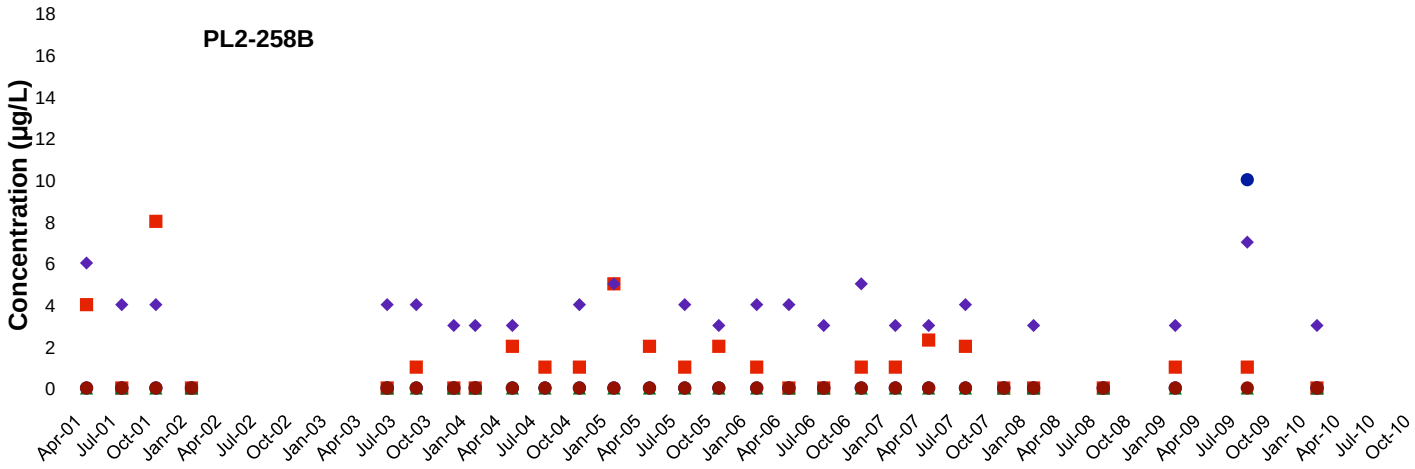
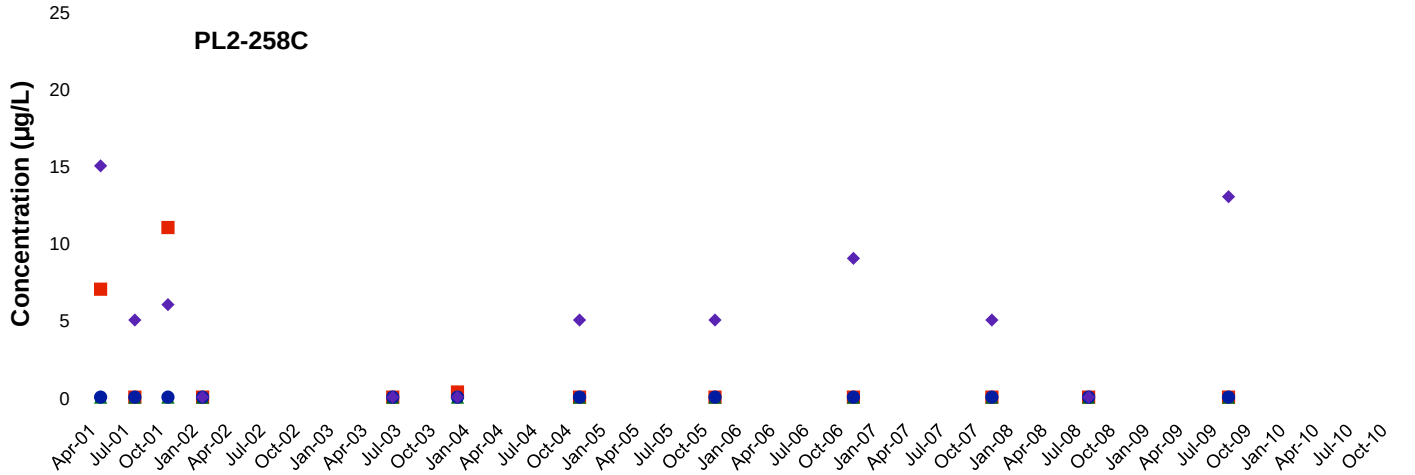
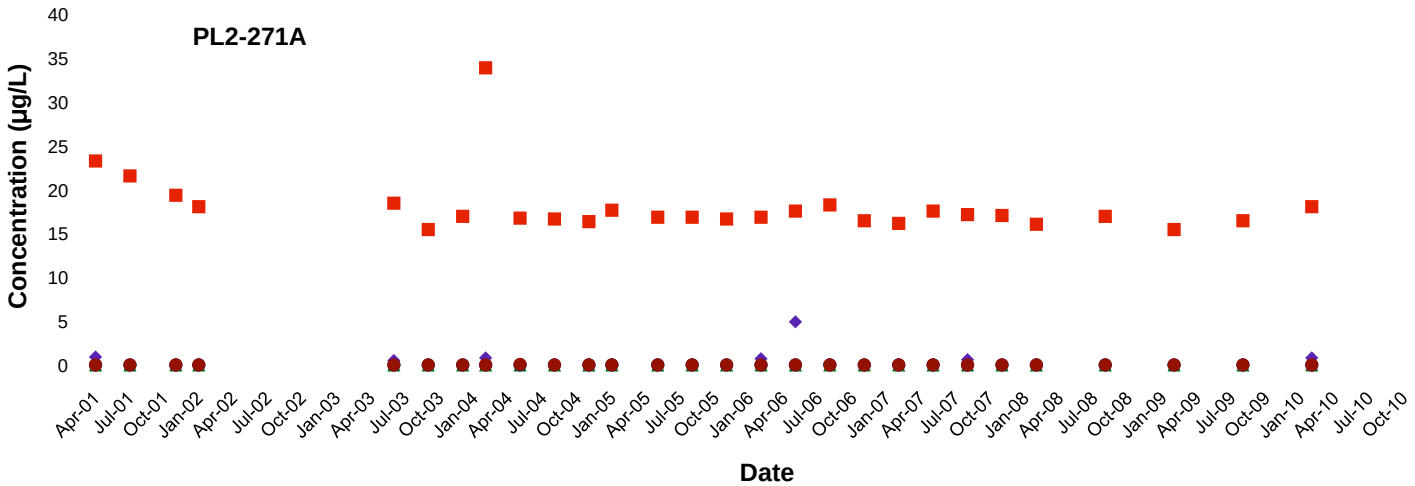
FIGURE 2-4f
DISSOLVED METALS TRENDS AT
PL2-232A, PL2-233A, AND PL2-258A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

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FIGURE 2-4g
DISSOLVED METALS TRENDS AT
PL2-258B, PL2-258C, AND PL2-271A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

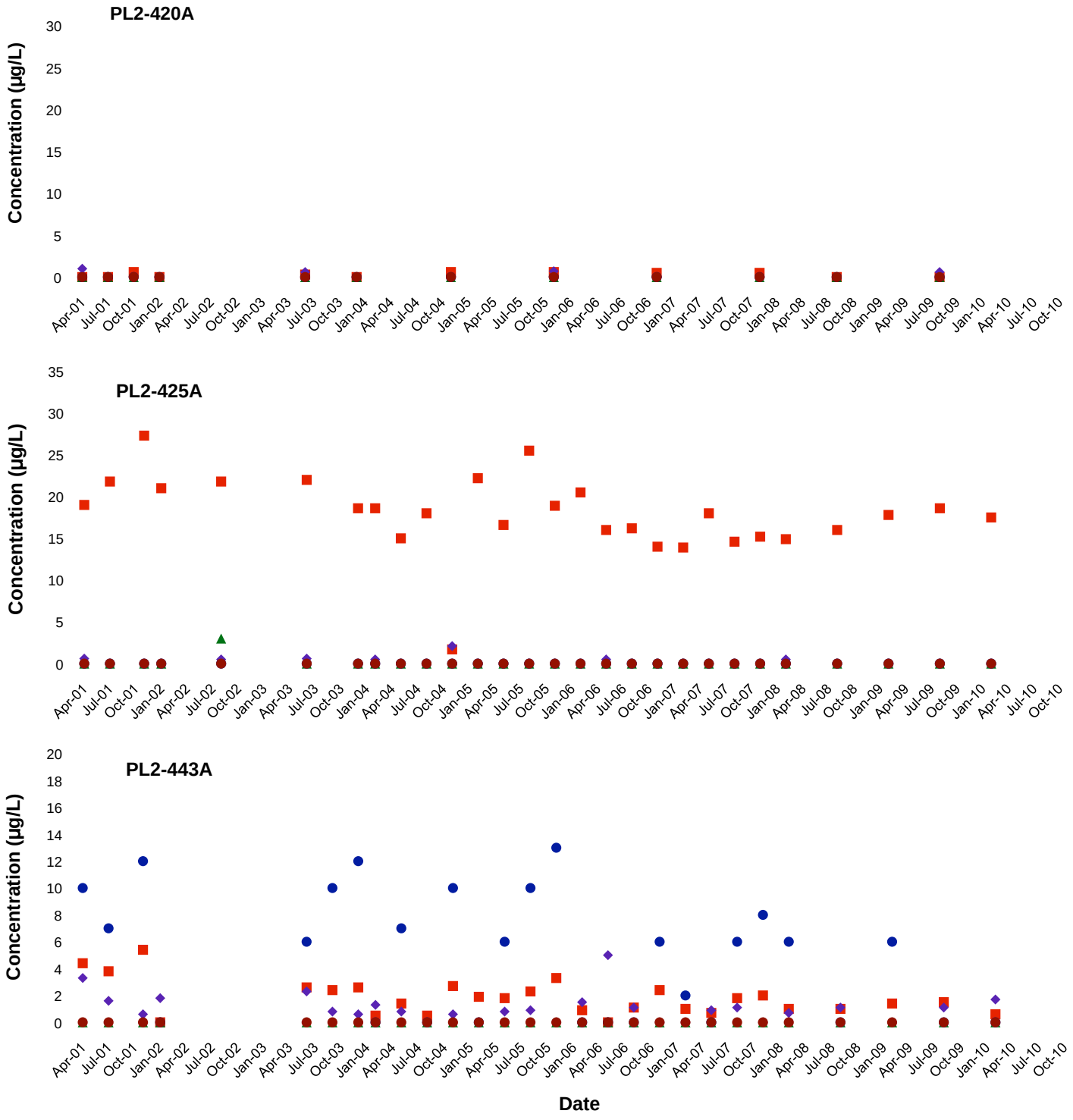


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FIGURE 2-4h
DISSOLVED METALS TRENDS AT
PL2-420A, PL2-425A, AND PL2-443A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

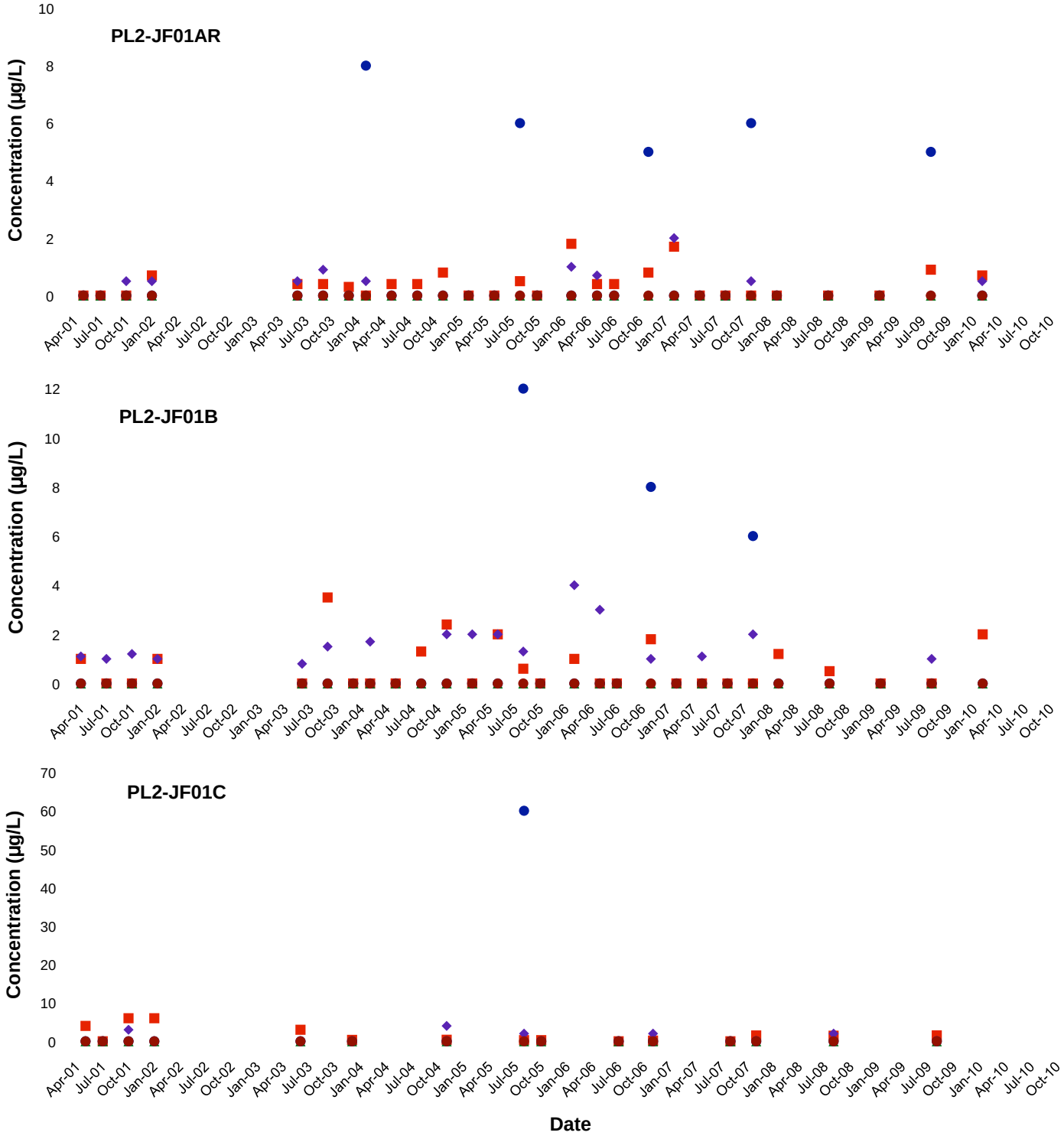


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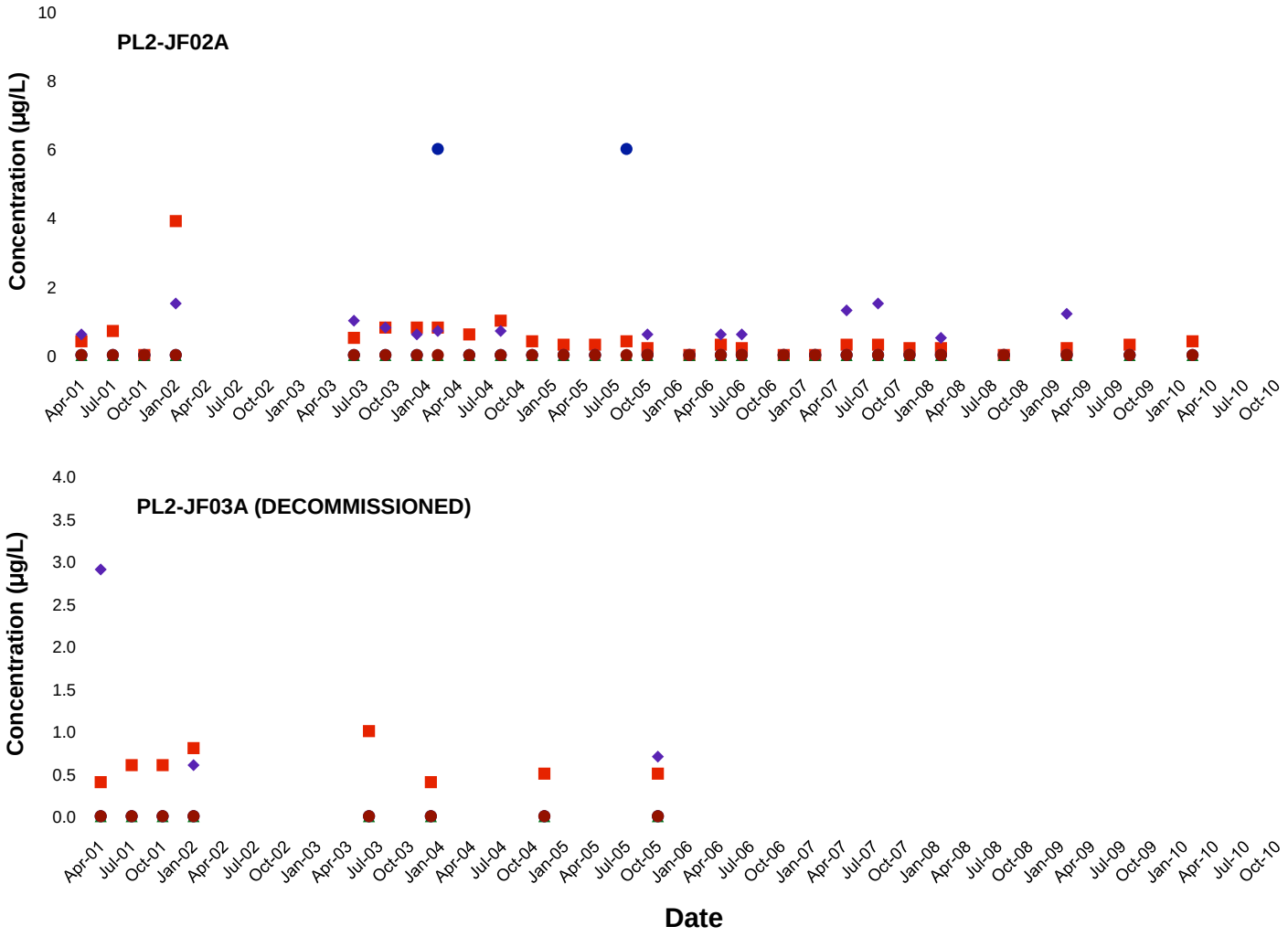
FIGURE 2-4i
DISSOLVED METALS TRENDS AT PL2-JF01AR, PL2-JF01B, AND PL2-JF01C

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |




Legend

- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Zinc

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FIGURE 2-4j
DISSOLVED METALS TRENDS AT
PL2-JF02A AND PL2-JF03A

| | |
|---|---|
| Project | Boeing Plant 2 |
| Prepared For | The Boeing Company |
| Location | 7725 East Marginal Way<br>Seattle/Tukwila, Washington |

| Drawn By | Reviewed By | Date |
|---|---|---|
| DCK | DCK | 5/10 |

# Tables

**Table 2-1 Shoreline Monitoring Program Monitoring Well Construction Details**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| Well Number | Casing Diameter (inches) | Top of Screen Depth (feet) | Bottom of Screen Depth (feet) | Screen Length (feet) | Depth to Pump Intake (feet below top of casing) |
|---|---|---|---|---|---|
| PL2-013A | 4 | 6 | 20 | 14 | 16 |
| PL2-607A | 2 | 6 | 21 | 15 | 16 |
| PL2-015A | 2 | 6 | 20.5 | 14.5 | 16 |
| PL2-015AR | 2 | 9.4 | 19 | 9.6 | 16 |
| PL2-015B | 2 | 40 | 50 | 10 | 45 |
| PL2-026C | 2 | 75 | 85 | 10 | NA |
| PL2-030A | 2 | 25 | 30 | 5 | 27.5 |
| PL2-030C | 2 | 75.5 | 80 | 4.5 | 77 |
| PL2-036A | 2 | 8 | 18 | 10 | 16 |
| PL2-036AR | 2 | 10.5 | 20 | 9.5 | 16 |
| PL2-043B | 2 | 50.5 | 55.2 | 4.7 | 52 |
| PL2-044B | 2 | 51.7 | 56 | 4.3 | 52 |
| PL2-214A | 2 | 15 | 30 | 15 | 17 |
| PL2-214B | 2 | 45 | 60 | 15 | 50 |
| PL2-214C | 2 | 76 | 80 | 4 | 77 |
| PL2-227A | 2 | 6 | 16.5 | 10.5 | 14.5 |
| PL2-232A | 2 | 11.5 | 21.5 | 10 | 17 |
| PL2-233A | 2 | 10 | 25 | 15 | 17.5 |
| PL2-258A | 2 | 8 | 23 | 15 | 16 |
| PL2-258B | 2 | 40 | 50 | 10 | 48 |
| PL2-258C | 2 | 92 | 100 | 8 | 97 |
| PL2-271A | 2 | 20.2 | 29.7 | 9.5 | 25 |
| PL2-420A | 2 | 14 | 29 | 15 | 17 |
| PL2-420C | 2 | 75 | 80 | 5 | NA |
| PL2-425A | 2 | 8 | 18 | 10 | 17 |
| PL2-425C | 2 | 77.5 | 82.5 | 5 | NA |
| PL2-443A | 2 | 8 | 23 | 15 | 17 |
| PL2-443C | 2 | 70 | 75 | 5 | NA |
| PL2-JF01AR | 2 | 22.5 | 27.5 | 5 | 25 |
| PL2-JF01B | 2 | 40 | 50 | 10 | 48 |
| PL2-JF01C | 2 | 74 | 78.5 | 4.5 | 77 |
| PL2-JF02A | 2 | 8 | 23 | 15 | 17 |
| PL2-JF03A | Well Decommissioned | | | | |

Notes:
NA = Not applicable
Well PL2-607A is a replacement well for PL2-013AR.
Well casings are constructed of PVC.
Dedicated pumps are QED Well Wizard bladder pumps.

**Table 2-2 Shoreline Monitoring Groundwater Sampling Field Parameters[a] – February 2010**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| Well | Temp. (°C) | Conductivity (µS/cm) | Dissolved Oxygen (mg/L) | pH | Redox Potential (mV) | Turbidity[b] (NTU) |
|---|---|---|---|---|---|---|
| PL2-013A | 8.59 | 6,145 | 6.86 | 7.53 | 143 | 2.0 |
| PL2-607A | 15.55 | 470 | 1.19 | 6.69 | 36 | 1.0 |
| PL2-015A | 9.72 | 6,350 | 7.88 | 6.87 | 534 | 34 |
| PL2-015AR | 12.78 | 1,275 | 6.94 | 6.23 | 685 | 17 |
| PL2-015B | 13.43 | 16,176 | 2.37 | 6.87 | 725 | 1.25 |
| PL2-026C | 12.08 | 30,185 | 1.61 | 7.11 | 723 | NM |
| PL2-030A | 12.02 | 2,996 | 0.97 | 7.16 | -124 | 2.2 |
| PL2-030C | 12.30 | 3,990 | 1.04 | 7.81 | -81 | NM |
| PL2-036A | 7.06 | 3,131 | 8.80 | 7.73 | 794 | 3.10 |
| PL2-036AR | 9.07 | 3,029 | 3.71 | 6.83 | 943 | 17.75 |
| PL2-043B | 11.51 | 18,855 | 1.60 | 6.97 | -237 | 6.8 |
| PL2-044B | 11.51 | 11,698 | 0.98 | 7.01 | 36 | NM |
| PL2-214A | 17.64 | 541 | 1.41 | 6.96 | 303 | 36.7 |
| PL2-214B | 17.28 | 21,516 | 9.51 | 7.11 | 348 | 6.3 |
| PL2-214C | 16.81 | 32,594 | 12.71 | 7.04 | 337 | NM |
| PL2-227A | 15.25 | 357 | 4.02 | 7.02 | 388 | 42 |
| PL2-232A | 20.14 | 357 | 1.17 | 6.99 | 286 | 5.9 |
| PL2-233A | 13.14 | 838 | 1.69 | 6.53 | 506 | 900 |
| PL2-258A | 17.56 | 487 | 1.20 | 7.01 | 415 | 13.3 |
| PL2-258B | 16.53 | 20,488 | 6.65 | 6.66 | 399 | 5.3 |
| PL2-258C | 16.67 | 33,333 | 8.40 | 7.05 | 364 | NM |
| PL2-271A | 18.33 | 500 | 1.61 | 7.03 | 305 | 6.6 |
| PL2-420A | 13.32 | 1,141 | 1.12 | 6.83 | 683 | NM |
| PL2-420C | 13.90 | 32,888 | 11.72 | 6.88 | 665 | NM |
| PL2-425A | 15.51 | 548 | 1.02 | 6.69 | 733 | 12.6 |
| PL2-425C | 14.61 | 28,948 | 1.94 | 7.16 | 518 | NM |
| PL2-443A | 11.08 | 2,976 | 5.14 | 6.83 | 618 | 21 |
| PL2-443C | 13.80 | 32,062 | 11.37 | 6.91 | 623 | NM |
| PL2-JF01AR | 13.66 | 1,437 | 0.81 | 6.66 | 333 | 7.4 |
| PL2-JF01B | 14.50 | 5,693 | 1.21 | 7.05 | 402 | 68 |
| PL2-JF01C | 13.61 | 18,745 | 1.17 | 6.95 | 525 | NM |
| PL2-JF02A | 12.83 | 538 | 0.63 | 6.84 | 353 | 13.49 |
| PL2-JF03A | Well Decommissioned | | | | | |

[a] Final field parameters after stabilization
[b] Turbidity of total metals sample (unfiltered)
[c] Anomalous value
NM – Not measured

**Table 2-3: Boeing Plant 2 - First Quarter 2010 - Shoreline Groundwater Sample Data, Summary of Detected Constituents**

| Constituent | Analytical Method | 2004 GW SL | PL2-013A 2/8/2010 | PL2-607A 2/8/2010 | PL2-015A 2/9/2010 | PL2-015AR 2/9/2010 | PL2-015AR DUP 2/9/2010 | PL2-015B 2/9/2010 | PL2-026C 2/9/2010 | PL2-030A 2/8/2010 | PL2-030C 2/8/2010 | PL2-036A 2/9/2010 | PL2-036AR 2/9/2010 | PL2-043B 2/8/2010 | PL2-044B 2/8/2010 | PL2-214A 2/10/2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | | | | | | | | | |
| Acetone | EPA 8260C | 6430000 | 10 U | 10 U | 10 U | 10 U | 10 U | 10 UJ | | 10 U | 10 U | 10 U | 10 U | 15 | 10 U | 10 U |
| Benzene | EPA 8260C | 4.48 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | EPA 8260C | 0.526 | 1 U | 1 U | **1** | **1.2** | **1.1** | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chlorobenzene | EPA 8260C | 1600 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroform | EPA 8260C | 56.1 | 1 U | 1 U | 2.2 | 3.4 | 3.2 | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | EPA 8260C | 1550 | 1 U | 3.9 | 1 U | 1 U | 1 U | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | EPA 8260C | 10000 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | EPA 8260C | 0.302 | **1.9** | **2.8** | **6.7** | **20** | **20** | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Vinyl Chloride | EPA 8260C | 0.731 | 1 U | **2** | 1 U | 1 U | 1 U | 1 UJ | | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| **PCBs (µg/L)** | | | | | | | | | | | | | | | | |
| Aroclor 1260 | EPA 8082 | 0.01 | | | | | | | | | | **0.019** | 0.01 U | | | |
| Total PCB | EPA 8082 | 0.01 | | | | | | | | | | **0.019** | 0.01 U | | | |
| **Inorganics (Total) (µg/L)** | | | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 6.3 | 0.2 U | 2.3 | 0.4 | 0.4 | 1 U | | 0.2 U | | 2.6 | 2.1 | 1 U | | 0.2 U |
| Arsenic | EPA 200.8 | 8 | 1.7 | 3.6 | 4 | 0.5 U | 0.5 U | 4.3 | | 1.1 | | 2.2 | 2 | 2 U | | 7.5 |
| Beryllium | EPA 200.8 | 135 | 0.5 U | 0.2 U | 0.5 U | 0.2 U | 0.2 U | 1 U | | 0.2 U | | 0.2 U | 0.2 U | 1 U | | 0.2 U |
| Cadmium | EPA 6010B | 8.8 | **38** | 2 U | 2 U | 2 U | 2 U | 4 U | | 2 U | | 2 U | 2 U | 10 U | | 2 U |
| Calcium | EPA 6010B | | 114000 | 26500 | 73300 | 48300 | 49700 | 192000 | | 26300 | | 51000 | 38200 | 221000 | | 10900 |
| Chromium | EPA 6010B | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 10 U | | 5 | | 5 U | 5 U | 20 U | | 5 U |
| Copper | EPA 200.8 | 8 | **30** | 0.5 U | **13** | 3.2 | 2.8 | 2 U | | 1.8 | | 2.5 | 4 | 2 U | | 1.4 |
| Iron | EPA 6010B | | 90 | 12600 | 1780 | 520 | 410 | 9410 | | 4570 | | 140 | 1930 | 460 | | 11400 J |
| Lead | EPA 200.8 | 8.1 | 4 | 1 U | 6 | 1 U | 1 U | 5 U | | 1 U | | 1 | 2 | 5 U | | 1 U |
| Magnesium | EPA 6010B | | 195000 | 20600 | 178000 | 30200 | 29000 | 479000 | | 65800 | | 108000 | 89000 | 604000 | | 11400 |
| Manganese | EPA 6010B | 2000 | 4 | 814 | 55 | 5 | 3 | 574 | | 71 | | 2 | 23 | 144 | | 381 |
| Mercury | EPA 7470A | 0.025 | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | | 0.02 U | 0.02 U | 0.02 U | | 0.02 U |
| Nickel | EPA 200.8 | 8.2 | **35** | 1.7 | 5 | 3.4 | 3 | 4 | | 3 | | 1.6 | 4.2 | 8 | | 1 |
| Selenium | EPA 6010B | 71 | 50 U | 50 U | 50 U | 50 U | 50 U | 100 U | | 50 U | | 50 U | 50 U | 250 U | | 50 U |
| Silver | EPA 200.8 | 1.9 | **10.2** | 0.2 U | 0.5 U | 0.2 U | 0.2 U | 1 U | | 0.2 U | | 0.2 U | 0.2 U | 1 U | | 0.2 U |
| Vanadium | EPA 6010B | 2810 | 3 U | 3 U | 5 | 4 | 3 | 6 U | | 3 | | 3 U | 4 | 20 U | | 6 |
| Zinc | EPA 6010B | 81 | **1320** | 10 U | **60** | 10 U | 10 U | 20 U | | 10 U | | 10 U | **530** | 50 U | | 10 U |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 6.1 | 0.2 U | 2.3 | 0.5 | 0.5 | 1 U | | 0.2 U | | 2.7 | 1.8 | 1 U | | 0.2 U |
| Arsenic | EPA 200.8 | 8 | 1.5 | 3.4 | 2.4 | 0.5 U | 0.5 U | 3 | | 1.2 | | 2.8 | 0.7 | 6 | | 0.7 |
| Beryllium | EPA 200.8 | 135 | 0.5 U | 0.2 U | 0.5 U | 0.2 U | 0.2 U | 1 U | | 0.2 U | | 0.2 U | 0.2 U | 1 U | | 0.2 U |
| Cadmium | EPA 6010B | 8.8 | **37** | 2 U | 2 U | 2 U | 2 U | 4 U | | 2 U | | 2 U | 2 U | 10 U | | 2 U |
| Calcium | EPA 6010B | | 111000 | 27300 | 71400 | 47400 | 50200 | 189000 | | 26700 | | 53100 | 38400 | 215000 | | 15900 |
| Chromium | EPA 6010B | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 10 U | | 5 U | | 5 U | 5 U | 20 U | | 5 U |
| Copper | EPA 200.8 | 8 | **23** | 0.9 | 4 | 2.2 | 2.2 | 2 U | | 1 | | 2 | 1.7 | 3 | | 0.5 U |
| Iron | EPA 6010B | | 50 U | 12300 | 50 U | 50 U | 50 U | 8870 | | 4370 | | 50 U | 50 U | 250 U | | 9610 |
| Lead | EPA 200.8 | 8.1 | 2 U | 1 U | 2 U | 1 U | 1 U | 5 U | | 1 U | | 1 U | 1 U | 5 U | | 1 U |
| Magnesium | EPA 6010B | | 189000 | 21100 | 174000 | 26800 | 28300 | 465000 | | 67000 | | 111000 | 88200 | 582000 | | 27300 |
| Manganese | EPA 6010B | 2000 | 1 U | 830 | 1 U | 1 U | 1 U | 577 | 739 | 71 | | 1 U | 1 U | 148 | | 367 |
| Mercury | EPA 7470A | 0.025 | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | | 0.02 U | 0.02 U | 0.02 U | | 0.02 U |
| Nickel | EPA 200.8 | 8.2 | **33** | 1.5 | 4 | 2.7 | 2.7 | 4 | **9** | 2.2 | | 1.6 | 2.9 | **10** | | 0.6 |
| Selenium | EPA 6010B | 71 | 50 | 50 U | 50 U | 50 U | 50 U | 100 U | | 50 U | | 50 U | 50 U | **320** | | 50 U |
| Silver | EPA 200.8 | 1.9 | **9.1** | 0.2 U | 0.5 U | 0.2 U | 0.2 U | 1 U | | 0.2 U | | 0.2 U | 0.2 U | 1 U | | 0.2 U |
| Vanadium | EPA 6010B | 2810 | 4 | 3 U | 3 U | 3 U | 3 U | 6 U | | 3 U | | 3 U | 3 U | 20 U | | 5 |
| Zinc | EPA 6010B | 81 | **1250** | 10 U | 40 | 10 U | 10 U | 20 U | | 10 U | | 10 U | **430** | 50 U | | 10 U |

Notes:

Chromium groundwater screening level based on chromium VI

Shading indicates concentration exceeds Plant 2 screening level or background level

U - Target analyte was not detected at the reported concentration

E - Indicates value above the linear range of the detector. Sample dilution required.

reporting limit.

**Table 2-3: Boeing Plant 2 - First Quarter 2010 - Shoreline Groundwater Sample Data, Summary of Detected Constituents**

| Constituent | Analytical Method | 2004 GW SL | PL2-214B 2/10/2010 | PL2-214C 2/10/2010 | PL2-227A 2/11/2010 | PL2-232A 2/10/2010 | PL2-233A 2/11/2010 | PL2-258A 2/10/2010 | PL2-258A Reanalysis 2/10/2010 | PL2-258B 2/10/2010 | PL2-258C 2/10/2010 | PL2-271A 2/10/2010 | PL2-420A 2/11/2010 | PL2-420C 2/11/2010 | PL2-425A 2/9/2010 | PL2-425C 2/9/2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | | | | | | | | | |
| Acetone | EPA 8260C | 6430000 | 10 U | 10 U | | 10 U | 10 U | 10 U | 100 U | 10 U | 10 U | 10 U | 10 U | | 10 U | |
| Benzene | EPA 8260C | 4.48 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| Carbon Tetrachloride | EPA 8260C | 0.526 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| Chlorobenzene | EPA 8260C | 1600 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| Chloroform | EPA 8260C | 56.1 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| cis-1,2-Dichloroethene | EPA 8260C | 1550 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 50 | 1 U | 1 U | 1 U | | 1 U | |
| trans-1,2-Dichloroethene | EPA 8260C | 10000 | 1 U | 1 U | | 1 U | 1 U | 2.3 | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| Trichloroethene | EPA 8260C | 0.302 | 1 U | 1 U | | 1 U | 1 U | 1 U | 10 U | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| Vinyl Chloride | EPA 8260C | 0.731 | 1 U | 1 U | | 1 U | 1 U | **250 E** | **300** | 1 U | 1 U | 1 U | 1 U | | 1 U | |
| **PCBs (µg/L)** | | | | | | | | | | | | | | | | |
| Aroclor 1260 | EPA 8082 | 0.01 | | | | | | | | | | | | | | |
| Total PCB | EPA 8082 | 0.01 | | | | | | | | | | | | | | |
| **Inorganics (Total) (µg/L)** | | | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 1 U | | 0.2 U | 0.2 U | 3.8 | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Arsenic | EPA 200.8 | 8 | 1 U | | 2 | 5.2 | **37.5** | 6.6 | | 1 U | | **16.5** | | | **16.6** | |
| Beryllium | EPA 200.8 | 135 | 1 U | | 0.2 U | 0.2 U | 0.7 | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Cadmium | EPA 6010B | 8.8 | 4 U | | 2 U | 2 U | 2 U | 2 U | | 4 U | | 2 U | | | 2 U | |
| Calcium | EPA 6010B | | 294000 | | 17200 | 7050 | 19600 | 15800 | | 357000 | | 21400 | | | 28900 | |
| Chromium | EPA 6010B | 50 | 10 U | | 5 U | 5 U | 25 | 5 U | | 10 U | | 5 U | | | 5 U | |
| Copper | EPA 200.8 | 8 | 3 | | 2.9 J+ | 1.1 | **20.6 J** | 0.6 | | 3 | | 0.5 U | | | 0.5 U | |
| Iron | EPA 6010B | | 9420 J | | 610 | 8690 J | 122000 | 10500 J | | 174000 J | | 26500 J | | | 33600 | |
| Lead | EPA 200.8 | 8.1 | 5 U | | 1 U | 1 U | 2 | 1 U | | 5 U | | 1 U | | | 1 U | |
| Magnesium | EPA 6010B | | 633000 | | 17400 | 10700 | 24400 | 12900 | | 593000 | | 20500 | | | 14100 | |
| Manganese | EPA 6010B | 2000 | **2450** | | 7 | 301 | 285 | 290 | | **6330** | | 680 | | | 522 | |
| Mercury | EPA 7470A | 0.025 | 0.02 U | | 0.02 U | 0.02 U | **0.076** | 0.02 U | | 0.02 U | | 0.02 U | | | 0.02 U | |
| Nickel | EPA 200.8 | 8.2 | **9** | | 1.6 | 0.7 | 3.5 | 0.9 | | 7 | | 0.7 | | | 0.5 | |
| Selenium | EPA 6010B | 71 | 100 U | | 50 U | 50 U | 50 U | 50 U | | 100 U | | 50 U | | | 50 U | |
| Silver | EPA 200.8 | 1.9 | 1 U | | 0.2 U | 0.2 U | 0.2 | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Vanadium | EPA 6010B | 2810 | 6 U | | 7 | 10 | 123 | 8 | | 6 U | | 5 | | | 8 | |
| Zinc | EPA 6010B | 81 | 20 U | | 10 U | 10 U | 10 | 10 U | | 20 U | | 10 U | | | 10 U | |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 1 U | | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Arsenic | EPA 200.8 | 8 | 1 | | 1.5 | 5.3 | 3.8 | 5.9 | | 1 U | | **18** | | | **17.5** | |
| Beryllium | EPA 200.8 | 135 | 1 U | | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Cadmium | EPA 6010B | 8.8 | 4 U | | 2 U | 2 U | 2 U | 2 U | | 4 U | | 2 U | | | 2 U | |
| Calcium | EPA 6010B | | 299000 | | 17100 | 8350 | 13400 | 14100 | | 352000 | | 21600 | | | 28900 | |
| Chromium | EPA 6010B | 50 | 10 U | | 5 U | 5 U | 5 U | 5 U | | 10 U | | 5 U | | | 5 U | |
| Copper | EPA 200.8 | 8 | 3 | | 2 | 0.9 | 0.6 U | 0.7 | | 3 | | 0.8 | | | 0.5 U | |
| Iron | EPA 6010B | | 9360 | | 50 U | 8110 | 9040 | 7000 | | 161000 | | 32200 | | | 31900 | |
| Lead | EPA 200.8 | 8.1 | 5 U | | 1 U | 1 U | 1 U | 1 U | | 5 U | | 1 U | | | 1 U | |
| Magnesium | EPA 6010B | | 631000 | | 17400 | 12100 | 22100 | 12500 | | 571000 | | 21200 | | | 14100 | |
| Manganese | EPA 6010B | 2000 | **2410** | | 6 | 290 | 137 | 283 | | **6080** | | 723 | | **2380** | 505 | 101 |
| Mercury | EPA 7470A | 0.025 | 0.02 U | | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | | 0.02 U | | | 0.02 U | |
| Nickel | EPA 200.8 | 8.2 | 8 | | 1.1 | 0.7 | 0.6 | 1 | | 7 | | 0.9 | | **9** | 0.6 | 8 |
| Selenium | EPA 6010B | 71 | 100 U | | 50 U | 50 U | 50 U | 50 U | | 100 U | | 50 U | | | 50 U | |
| Silver | EPA 200.8 | 1.9 | 1 U | | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 1 U | | 0.2 U | | | 0.2 U | |
| Vanadium | EPA 6010B | 2810 | 6 U | | 5 | 9 | 14 | 7 | | 6 U | | 7 | | | 7 | |
| Zinc | EPA 6010B | 81 | 20 U | | 10 U | 10 U | 10 U | 10 U | | 20 U | | 10 U | | | 10 U | |

Notes:

Chromium groundwater screening level based on chromium VI

Shading indicates concentration exceeds Plant 2 screening level or background level

U - Target analyte was not detected at the reported concentration

E - Indicates value above the linear range of the detector. Sample dilution required.

reporting limit.

**Table 2-3: Boeing Plant 2 - First Quarter 2010 - Shoreline Groundwater Sample Data, Summary of Detected Constituents**

| Constituent | Analytical Method | 2004 GW SL | PL2-443A 2/11/2010 | PL2-443C 2/11/2010 | PL2-JF01AR 2/8/2010 | PL2-JF01B 2/8/2010 | PL2-JF01C 2/8/2010 | PL2-JF02A 2/8/2010 |
|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | |
| Acetone | EPA 8260C | 6430000 | 10 U | | 10 U | 10 U | 10 U | 10 U |
| Benzene | EPA 8260C | 4.48 | 1 U | | **4.9** | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | EPA 8260C | 0.526 | 1 U | | 1 U | 1 U | 1 U | 1 U |
| Chlorobenzene | EPA 8260C | 1600 | 1 U | | 36 | 1 U | 1 U | 1 U |
| Chloroform | EPA 8260C | 56.1 | 1 U | | 1 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | EPA 8260C | 1550 | 1 U | | 1 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | EPA 8260C | 10000 | 1 U | | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | EPA 8260C | 0.302 | 1 U | | 1 U | 1 U | 1 U | 1 U |
| Vinyl Chloride | EPA 8260C | 0.731 | 1 U | | **100** | **20** | 1 U | 1 U |
| **PCBs (µg/L)** | | | | | | | | |
| Aroclor 1260 | EPA 8082 | 0.01 | | | | | | |
| Total PCB | EPA 8082 | 0.01 | | | | | | |
| **Inorganics (Total) (µg/L)** | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Arsenic | EPA 200.8 | 8 | 0.6 | | 0.6 | 2 | | 0.7 |
| Beryllium | EPA 200.8 | 135 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Cadmium | EPA 6010B | 8.8 | 2 U | | 2 U | 2 U | | 2 U |
| Calcium | EPA 6010B | | 35600 | | 51600 | 88300 | | 24100 |
| Chromium | EPA 6010B | 50 | 5 U | | 5 U | 5 U | | 5 U |
| Copper | EPA 200.8 | 8 | 1.9 J+ | | 0.7 | 1 | | 0.8 |
| Iron | EPA 6010B | | 3410 | | 23700 | 26300 | | 7020 |
| Lead | EPA 200.8 | 8.1 | 1 U | | 1 U | 2 U | | 1 U |
| Magnesium | EPA 6010B | | 79900 | | 40900 | 120000 | | 27400 |
| Manganese | EPA 6010B | 2000 | 136 | | **2670** | 1350 | | 482 |
| Mercury | EPA 7470A | 0.025 | 0.02 U | | 0.02 U | 0.02 U | | 0.02 U |
| Nickel | EPA 200.8 | 8.2 | 1.4 | | 1 | 2 | | 1.6 |
| Selenium | EPA 6010B | 71 | 50 U | | 50 U | 50 U | | 50 U |
| Silver | EPA 200.8 | 1.9 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Vanadium | EPA 6010B | 2810 | 3 U | | 11 | 6 | | 7 |
| Zinc | EPA 6010B | 81 | 10 U | | 10 | 10 U | | 10 U |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | |
| Antimony | EPA 200.8 | 513 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Arsenic | EPA 200.8 | 8 | 0.6 | | 0.7 | 2 | | 0.4 |
| Beryllium | EPA 200.8 | 135 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Cadmium | EPA 6010B | 8.8 | 2 U | | 2 U | 2 U | | 2 U |
| Calcium | EPA 6010B | | 35200 | | 52800 | 83500 | | 24200 |
| Chromium | EPA 6010B | 50 | 5 U | | 5 U | 5 U | | 5 U |
| Copper | EPA 200.8 | 8 | 1.7 J+ | | 0.5 | 1 U | | 0.5 U |
| Iron | EPA 6010B | | 1130 | | 24600 | 21000 | | 4950 |
| Lead | EPA 200.8 | 8.1 | 1 U | | 1 U | 2 U | | 1 U |
| Magnesium | EPA 6010B | | 79800 | | 41500 | 114000 | | 27900 |
| Manganese | EPA 6010B | 2000 | 127 | **2720** | **2650** | 1250 | | 458 |
| Mercury | EPA 7470A | 0.025 | 0.02 U | | 0.02 U | 0.02 U | | 0.02 U |
| Nickel | EPA 200.8 | 8.2 | 1.4 | **10** | 2 | 2 | | 1.1 |
| Selenium | EPA 6010B | 71 | 50 U | | 50 U | 50 U | | 50 U |
| Silver | EPA 200.8 | 1.9 | 0.2 U | | 0.2 U | 0.5 U | | 0.2 U |
| Vanadium | EPA 6010B | 2810 | 3 U | | 11 | 5 | | 6 |
| Zinc | EPA 6010B | 81 | 10 U | | 10 U | 10 U | | 10 U |

Notes:

Chromium groundwater screening level based on chromium VI

Shading indicates concentration exceeds Plant 2 screening level or background level

U - Target analyte was not detected at the reported concentration

E - Indicates value above the linear range of the detector. Sample dilution required.

reporting limit.

**Table 2-4 Shoreline Monitoring Groundwater Sampling VOC Results Summary – February 2010**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| VOC | Number of Wells with Detects | Percentage[a] of Wells Sampled with Detects | Number of wells with Detects Above Screening Levels[b] | Percentage[a] of Wells with Detects Above Screening Levels[b] | Concentration Range of Detected Values (µg/L) |
|---|---|---|---|---|---|
| Acetone | 1 | 4% | 0 | 0% | 15 |
| Benzene | 1 | 4% | 1 | 4% | 4.9 |
| Carbon tetrachloride | 2 | 7% | 2 | 7% | 1.0 to 1.2 |
| Chlorobenzene | 1 | 4% | 0 | 0% | 36 |
| Chloroform | 2 | 7% | 0 | 0% | 2.2 to 3.4 |
| cis-1,2-Dichloroethene | 2 | 7% | 0 | 0% | 3.9 to 50 |
| trans-1,2-Trichloroethene | 1 | 4% | 0 | 0% | 2.3 |
| Trichloroethene | 4 | 15% | 4 | 15% | 1.9 to 20 |
| Vinyl chloride | 4 | 15% | 4 | 15% | 2.0 to 300 |
| All analyzed VOCs[c] | 9 | 33% | 7 | 26% | NA |

[a] Percentage based on 27 wells sampled for VOCs during this monitoring event.
[b] Draft CMS (2004) Screening Levels
[c] Number of wells with one or more detection of any VOC analyzed.
NA = Not Applicable

**Table 2-5 Summary of Mann-Kendall Statistical Test for Trend in VOC Data – February 2010**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| Well Number | Trend Direction (if statistically significant) | | | |
|---|---|---|---|---|
| | Trichloroethene | cis-1,2-DCE | trans 1,2,-DCE | Vinyl Chloride |
| PL2-013A | NT > | NT < | NT < | DOWN < |
| PL2-607A | DOWN > | DOWN < | NT < | UP > |
| PL2-015A | DOWN > | DOWN < | NT < | NT < |
| PL2-015AR | DOWN > | DOWN < | NT < | NT < |
| PL2-015B | NT < | NT < | NT < | NT < |
| PL2-030A | DOWN < | DOWN < | DOWN < | DOWN < |
| PL2-030C | NT < | NT < | NT < | NT < |
| PL2-036A | NT < | NT < | NT < | NT < |
| PL2-036AR | NT < | DOWN < | NT < | NT < |
| PL2-043B | NT < | DOWN < | DOWN < | DOWN < |
| PL2-044B | NT < | DOWN < | DOWN < | DOWN < |
| PL2-214A | NT < | NT < | NT < | NT < |
| PL2-214B | NT < | NT < | NT < | NT < |
| PL2-214C | NT < | NT < | NT < | NT < |
| PL2-227A | NT < | NT < | NT < | NT < |
| PL2-232A | NT < | NT < | NT < | NT < |
| PL2-233A | NT < | NT < | NT < | NT < |
| PL2-258A | NT < | DOWN < | DOWN < | DOWN > |
| PL2-258B | NT < | DOWN < | DOWN < | DOWN < |
| PL2-258C | NT < | NT < | NT < | NT < |
| PL2-271A | NT < | NT < | NT < | DOWN < |
| PL2-420A | NT < | NT < | NT < | DOWN < |
| PL2-425A | NT < | NT < | NT < | NT < |
| PL2-443A | NT < | DOWN < | NT < | DOWN < |
| PL2-JF01AR | DOWN < | DOWN < | DOWN < | NT > |
| PL2-JF01B | NT < | DOWN < | NT < | DOWN > |
| PL2-JF01C | NT < | NT < | NT < | NT < |
| PL2-JF02A | NT < | NT < | NT < | DOWN < |
| PL2-JF03A | DECOMMISSIONED | | | |

DOWN = Statistically significant downward trend
UP = Statistically significant upward trend
NT = No statistically significant trend
< = Most recent concentration is less than the 2004 screening level
> = Most recent concentration is greater than the 2004 screening level

**Table 2-6 Shoreline Monitoring Groundwater Sampling Metals Results Summary – February 2010**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| Metal | Number of Wells with Detects | Percentage[a] of Wells Sampled with Detects | Number of Detects Above Screening Levels[b] | Percentage[a] of Wells with Detects Above Screening Levels[b] | Concentration Range of Detected Values (µg/L) |
|---|---|---|---|---|---|
| Antimony (total) | 6 | 27% | 0 | 0% | 0.4 to 6.3 |
| Antimony (dissolved) | 5 | 23% | 0 | 0% | 0.5 to 6.1 |
| Arsenic (total) | 18 | 82% | 3 | 14% | 0. 6 to 37.5 |
| Arsenic (dissolved) | 20 | 91% | 2 | 9% | 0.4 to 18.0 |
| Beryllium (total) | 1 | 5% | 0 | 0% | 0.7 |
| Beryllium (dissolved) | 0 | 0% | 0 | 0% | Not detected |
| Cadmium (total) | 1 | 5% | 1 | 5% | 38 |
| Cadmium (dissolved) | 1 | 5% | 1 | 5% | 37 |
| Chromium (total)[c] | 2 | 9% | 0 | 0% | 5.0 and 25 |
| Chromium (dissolved)[c] | 0 | 0% | 0 | 0% | Not detected |
| Copper (total) | 17 | 77% | 3 | 14% | 0.6 to 30 |
| Copper (dissolved) | 16 | 73% | 1 | 5% | 0.5 to 23 |
| Lead (total) | 5 | 23% | 0 | 0% | 1.0 to 6.0 |
| Lead (dissolved) | 0 | 0% | 0 | 0% | Not detected |
| Manganese (total) | 22 | 100% | 3 | 14% | 2.0 to 6330 |
| Manganese (dissolved) | 21 | 81% | 5 | 19% | 6.0 to 6080 |
| Mercury (total) | 1 | 5% | 1 | 5% | 0.076 |
| Mercury (dissolved) | 0 | 0% | 0 | 0% | Not detected |
| Nickel (total) | 22 | 100% | 2 | 9% | 0.5 to 35 |
| Nickel (dissolved) | 26 | 100% | 5 | 19% | 0.6 to 33 |
| Selenium (total) | 0 | 0% | 0 | 0% | Not detected |
| Selenium (dissolved) | 2 | 9% | 1 | 5% | 50 and 320 |
| Silver (total) | 2 | 9% | 1 | 5% | 0.2 and 10.2 |
| Silver (dissolved) | 1 | 5% | 1 | 5% | 9.1 |
| Vanadium (total) | 14 | 64% | 0 | 0% | 3.0 to 123 |
| Vanadium (dissolved) | 11 | 50% | 0 | 0% | 4.0 to 14 |
| Zinc (total) | 5 | 23% | 3 | 14% | 10 to 1320 |
| Zinc (dissolved) | 3 | 14% | 2 | 9% | 40 to 1250 |

[a] Percentage based on 22 wells sampled for metals during this monitoring event. Nickel and Manganese percentages are based on 26 wells for dissolved metals.
[b] Draft CMS (2004) screening levels or 2006 background levels.
[c] Chromium VI screening level of 50 µg/L applied to chromium data

**Table 2-7 Summary of Mann-Kendall Statistical Test for Trend in Dissolved Metals Data – February 2010**
**Boeing Plant 2, Seattle/Tukwila, Washington**

| | Trend Direction (if statistically significant) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Well Number** | **Arsenic** | **Cadmium** | **Chromium[a]** | **Copper** | **Lead** | **Mercury** | **Nickel** | **Zinc** |
| PL2-013A | NT < | NT > | NT < | DOWN > | NT < | DOWN < | NT > | NT > |
| PL2-607A | NT < | NT < | NT < | DOWN < | NT < | NT < | DOWN < | NT < |
| PL2-015A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-015AR | NT < | NT < | NT < | NT < | NT < | NT < | DOWN < | NT < |
| PL2-015B | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-030A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-030C | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-036A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-036AR | NT < | NT < | NT < | UP < | NT < | NT < | NT < | UP > |
| PL2-043B | NT < | NT < | NT < | NT < | NT < | NT < | NT > | NT < |
| PL2-044B | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-214A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-214B | NT < | NT < | NT < | UP < | NT < | NT < | NT < | NT < |
| PL2-214C | NT < | NT < | NT < | NT < | NT < | NT < | NT > | NT < |
| PL2-227A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | UP < |
| PL2-232A | UP < | NT < | NT < | NT < | NT < | NT < | DOWN < | UP < |
| PL2-233A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-258A | NT < | NT < | NT < | UP < | NT < | NT < | NT < | NT < |
| PL2-258B | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-258C | NT < | NT < | NT < | NT > | NT < | NT < | NT > | NT < |
| PL2-271A | DOWN > | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-420A | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-425A | DOWN > | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-443A | DOWN < | NT < | DOWN < | NT < | NT < | NT < | DOWN < | UP < |
| PL2-JF01AR | DOWN < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-JF01B | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-JF01C | NT < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-JF02A | DOWN < | NT < | NT < | NT < | NT < | NT < | NT < | NT < |
| PL2-JF03A | DECOMMISSIONED | | | | | | | |

DOWN = Statistically significant downward trend
UP = Statistically significant upward trend
NT = No statistically significant trend
< = Most recent concentration is less than the 2004 screening level or 2006 background level
> = Most recent concentration is greater than the 2004 screening level or 2006 background level
[a] Chromium VI screening level of 50 µg/L applied to chromium data.

# Attachment A

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-013A 8/10/2009 | PL2-607A 8/10/2009 | PL2-015A 8/11/2009 | PL2-015AR 8/11/2009 | PL2-015AR DUP 8/11/2009 | PL2-015B 8/11/2009 | PL2-030A 8/10/2009 | PL2-030A Reanalysis 8/10/2009 | PL2-030A DUP 8/10/2009 | PL2-030A DUP Reanalysis 8/10/2009 | PL2-030C 8/10/2009 | PL2-036A 8/11/2009 | PL2-036AR 8/11/2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,1,2,2-Tetrachloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichlorotrifluoroethane | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 6 U | 2 U | 6 UJ | 2 U | 2 U | 2 U |
| 1,1-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,2-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 1,2-Dichloropropane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| 2-Butanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 15 U | 5 U | 15 U | 5 U | 5 U | 5 U |
| 2-Chloroethylvinylether | EPA 8260C | 5 UJ | 5 UJ | 5 U | 5 U | 5 U | 5 U | 5 UJ | 15 UJ | 5 U | 5 UJ | 5 UJ | 5 U | 5 U |
| 2-Hexanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 15 U | 5 U | 15 U | 5 U | 5 U | 5 U |
| Acetone | EPA 8260C | 5 UJ | 5 UJ | 10 U | 10 U | 10 U | 10 U | 5 UJ | 15 UJ | 10 U | 5 UJ | 5 UJ | 10 U | 10 U |
| Benzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Bromodichloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Bromoform | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Bromomethane | EPA 8260C | 1 U | 1 U | 1 UJ | 1 U | 1 UJ | 1 UJ | 1 U | 3 U | 1 U | 3 UJ | 1 U | 1 UJ | 1 UJ |
| Carbon Disulfide | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Chlorobenzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Chloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Chloroform | EPA 8260C | 1 U | 1 U | 1 U | 3.2 | 3.2 | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Chloromethane | EPA 8260C | 1 UJ | 1 UJ | 1 U | 1 U | 1 U | 1 U | 1 UJ | 3 UJ | 1 U | 1 UJ | 1 UJ | 1 U | 1 U |
| cis-1,2-Dichloroethene | EPA 8260C | 1 U | 2 | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| cis-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Dibromochloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Ethylbenzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| m,p-Xylene | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 6 U | 2 U | 6 U | 2 U | 2 U | 2 U |
| Methyl isobutyl ketone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 15 U | 5 U | 15 U | 5 U | 5 U | 5 U |
| Methylene Chloride | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 6 U | 2 U | 6 U | 2 U | 2 U | 2 U |
| o-Xylene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Styrene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Tetrachloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Toluene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| trans-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Trichloroethene | EPA 8260C | 2.4 | 6.8 | 1.2 | 18 | 18 | 1 U | 1 U | 3 U | 1 U | 3 U | 1 U | 1 U | 1 U |
| Trichlorofluoromethane | EPA 8260C | 1 U | 1 U | 1 UJ | 1 U | 1 U | 1 UJ | 1 U | 3 U | 1 U | 3 U | 1 U | 1 UJ | 1 UJ |
| Vinyl Acetate | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 15 U | 5 U | 15 U | 5 U | 5 U | 5 U |
| Vinyl Chloride | EPA 8260C | 1 U | 1.2 | 1 U | 1 U | 1 U | 1 U | 66 E | 65 | 68 E | 64 | 1 U | 1 U | 1 U |
| **PCBs (µg/L)** | | | | | | | | | | | | | | |
| Aroclor 1016 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1221 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1232 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1242 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1248 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1254 | EPA 8082 | | | | | | | | | | | | 0.01 U | 0.01 U |
| Aroclor 1260 | EPA 8082 | | | | | | | | | | | | 0.019 | 0.01 U |
| Total PCB | EPA 8082 | | | | | | | | | | | | 0.019 | 0.01 U |

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-013A 8/10/2009 | PL2-607A 8/10/2009 | PL2-015A 8/11/2009 | PL2-015AR 8/11/2009 | PL2-015AR DUP 8/11/2009 | PL2-015B 8/11/2009 | PL2-030A 8/10/2009 | PL2-030A Reanalysis 8/10/2009 | PL2-030A DUP 8/10/2009 | PL2-030A DUP Reanalysis 8/10/2009 | PL2-030C 8/10/2009 | PL2-036A 8/11/2009 | PL2-036AR 8/11/2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Total) (µg/L)** | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 9 | 0.2 U | 3 | 0.6 | 0.6 | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 4 | 2 |
| Arsenic | EPA 200.8 | 2 | 2.7 | 9 | 0.8 | 0.8 | 4 | 1 | | 0.5 | | 1.7 | 5 | 2 |
| Arsenic | HG-AFS | | | | | | | | | | | 1.49 | | |
| Beryllium | EPA 200.8 | 1 U | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Cadmium | EPA 6010B | 138 | 2 U | 3 | 2 U | 2 U | 4 U | 2 U | | 2 U | | 2 U | 4 U | 2 U |
| Calcium | EPA 6010B | 168000 | 27800 | 158000 | 28300 | 27600 | 196000 | 12100 | | 11700 | | 46200 | 180000 | 89800 |
| Chromium | EPA 6010B | 5 U | 5 U | 8 | 5 U | 5 U | 10 U | 7 | | 5 U | | 5 U | 10 U | 5 U |
| Copper | EPA 200.8 | 36 | 0.7 | 25 | 2 | 2.6 | 2 U | 1.8 | | 0.6 | | 2.7 | 11 | 5 |
| Iron | EPA 6010B | 50 U | 13100 | 3640 | 130 | 130 | 8980 | 2940 | | 2930 | | 3120 | 100 U | 690 |
| Lead | EPA 200.8 | 5 U | 1 U | 9 | 1 U | 1 U | 5 U | 1 U | | 1 U | | 1 U | 5 U | 2 U |
| Magnesium | EPA 6010B | 416000 | 24900 | 385000 | 11400 | 11200 | 510000 | 32400 J | | 33000 | | 89800 | 465000 | 196000 |
| Manganese | EPA 6010B | 1 U | 974 | 123 | 2 | 2 | 629 | 44 J | | 41 | | 116 | 2 U | 8 |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.0439 | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 66 | 1.4 | 11 | 1.9 | 2.4 | 7 | 1.2 | | 0.7 | | 2.6 | 8 | 6 |
| Selenium | EPA 6010B | 50 U | 50 U | 50 U | 50 U | 50 U | 100 U | 50 U | | 50 U | | 50 U | 100 U | 50 U |
| Selenium | HG-AFS | | | | | | | | | | | 0.123 | | |
| Silver | EPA 200.8 | 71 | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Thallium | EPA 200.8 | 1 U | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Vanadium | EPA 6010B | 3 U | 3 U | 10 | 6 | 6 | 6 U | 6 | | 5 | | 6 | 6 U | 4 |
| Zinc | EPA 6010B | 2460 | 10 U | 150 | 10 U | 10 U | 20 U | 10 U | | 10 U | | 10 U | 20 U | 60 |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 8 | 0.2 U | 3 | 0.7 | 0.7 | 1 U | 0.2 U | | 0.2 U | | 0.4 | 4 | 1.7 |
| Arsenic | EPA 200.8 | 2 | 2.8 | 4 | 0.8 | 0.8 | 2 U | 0.5 U | | 0.5 U | | 1.2 | 5 | 2.9 |
| Arsenic | HG-AFS | | | | | | | | | | | 1.4 | | |
| Beryllium | EPA 200.8 | 1 U | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Cadmium | EPA 6010B | 156 | 2 U | 2 | 2 U | 2 U | 4 U | 2 U | | 2 U | | 2 U | 4 U | 2 U |
| Calcium | EPA 6010B | 188000 | 28900 | 173000 | 28300 | 27900 | 197000 | 13500 | | 13300 | | 51400 | 195000 | 96500 |
| Chromium | EPA 6010B | 5 | 5 U | 5 U | 5 U | 5 U | 10 | 5 U | | 5 U | | 5 U | 20 | 5 U |
| Copper | EPA 200.8 | 24 | 0.5 U | 9 | 2 | 1.8 | 2 U | 0.5 U | | 0.5 U | | 1.4 | 10 | 4 |
| Iron | EPA 6010B | 50 U | 13000 | 50 U | 50 U | 50 U | 8610 | 3110 | | 3080 | | 2290 | 100 U | 50 U |
| Lead | EPA 200.8 | 5 U | 1 U | 5 U | 1 U | 1 U | 5 U | 1 U | | 1 U | | 1 U | 5 U | 2 U |
| Magnesium | EPA 6010B | 465000 | 25900 | 419000 | 11900 | 11700 | 511000 | 36200 | | 35500 | | 96700 | 508000 | 210000 |
| Manganese | EPA 6010B | 50 | 1000 | 1 U | 1 U | 1 | 639 | 48 | | 48 | | 187 | 2 U | 1 U |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 65 | 1.4 | 9 | 1.8 | 1.6 | 7 | 0.8 | | 0.8 | | 2.1 | 8 | 5 |
| Selenium | EPA 6010B | 50 U | 50 U | 50 U | 50 U | 50 U | 100 U | 50 U | | 50 U | | 50 U | 100 U | 50 U |
| Selenium | HG-AFS | | | | | | | | | | | 0.123 | | |
| Silver | EPA 200.8 | 67 | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Thallium | EPA 200.8 | 1 U | 0.2 U | 1 U | 0.2 U | 0.2 U | 1 U | 0.2 U | | 0.2 U | | 0.2 U | 1 U | 0.5 U |
| Vanadium | EPA 6010B | 3 U | 3 U | 3 U | 6 | 6 | 6 U | 6 | | 6 | | 7 | 6 U | 3 U |
| Zinc | EPA 6010B | 2590 | 10 U | 110 | 10 U | 10 U | 20 U | 10 U | | 10 U | | 10 U | 20 U | 70 |

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-043B 8/10/2009 | PL2-044B 8/10/2009 | PL2-214A 8/12/2009 | PL2-214A DUP 8/12/2009 | PL2-214B 8/12/2009 | PL2-214C 8/12/2009 | PL2-227A 8/11/2009 | PL2-232A 8/11/2009 | PL2-233A 8/11/2009 | PL2-258A 8/12/2009 | PL2-258B 8/12/2009 | PL2-258C 8/12/2009 | PL2-271A 8/12/2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2,2-Tetrachloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichlorotrifluoroethane | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| 1,1-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloropropane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 2-Butanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| 2-Chloroethylvinylether | EPA 8260C | 5 UJ | 5 UJ | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| 2-Hexanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Acetone | EPA 8260C | 5 UJ | 5 UJ | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U |
| Benzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromodichloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromoform | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromomethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 UJ | 1 UJ | 1 UJ | 1 U | 1 U | 1 U | 1 U |
| Carbon Disulfide | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chlorobenzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroform | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloromethane | EPA 8260C | 1 UJ | 1 UJ | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 160 | 1 U | 1 U |
| cis-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Dibromochloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Ethylbenzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| m,p-Xylene | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Methyl isobutyl ketone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Methylene Chloride | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| o-Xylene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Styrene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tetrachloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Toluene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| trans-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Trichlorofluoromethane | EPA 8260C | 1 U | 1 U | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 1 UJ |
| Vinyl Acetate | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Vinyl Chloride | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 54 | 1 U | 1 U | 1 U |
| **PCBs (µg/L)** | | | | | | | | | | | | | | |
| Aroclor 1016 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1221 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1232 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1242 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1248 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1254 | EPA 8082 | | | | | | | | | | | | | |
| Aroclor 1260 | EPA 8082 | | | | | | | | | | | | | |
| Total PCB | EPA 8082 | | | | | | | | | | | | | |

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-043B 8/10/2009 | PL2-044B 8/10/2009 | PL2-214A 8/12/2009 | PL2-214A DUP 8/12/2009 | PL2-214B 8/12/2009 | PL2-214C 8/12/2009 | PL2-227A 8/11/2009 | PL2-232A 8/11/2009 | PL2-233A 8/11/2009 | PL2-258A 8/12/2009 | PL2-258B 8/12/2009 | PL2-258C 8/12/2009 | PL2-271A 8/12/2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Total) (µg/L)** | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.5 | 0.2 U | 1 U | 2 U | 0.2 U |
| Arsenic | EPA 200.8 | 2 U | 2 U | 1 | 1.2 | 2 | 3 | 1.7 | 4.9 | 18.9 | 6.6 | 2 | 2 | 16.5 |
| Arsenic | HG-AFS | | | | | | 0.263 | | | | | | 0.050 U | |
| Beryllium | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Cadmium | EPA 6010B | 4 U | 2 U | 2 U | 2 U | 4 U | 10 U | 2 U | 2 U | 2 U | 2 U | 4 U | 10 U | 2 U |
| Calcium | EPA 6010B | 199000 | 117000 | 9410 | 9430 | 322000 | 469000 | 17700 | 6470 | 28200 | 13800 | 434000 | 460000 | 22600 |
| Chromium | EPA 6010B | 10 U | 5 U | 5 U | 5 U | 30 | 60 | 5 U | 5 U | 10 | 5 U | 30 | 50 | 5 U |
| Copper | EPA 200.8 | 4 | 8 | 0.5 U | 0.8 | 8 | 8 | 2.7 | 1.3 | 4.9 | 0.8 | 8 | 13 | 0.8 |
| Iron | EPA 6010B | 1200 | 1710 | 9440 | 9480 | 9430 | 18200 | 60 | 5080 | 46700 | 9310 | 191000 | 34400 | 30600 |
| Lead | EPA 200.8 | 5 U | 5 U | 1 U | 1 U | 5 U | 10 U | 1 U | 1 U | 1 U | 1 U | 5 U | 10 U | 1 U |
| Magnesium | EPA 6010B | 570000 | 299000 | 9940 | 9930 | 681000 | 1020000 | 23300 | 9270 | 58500 | 11300 | 660000 | 986000 | 20600 |
| Manganese | EPA 6010B | 141 | 140 | 338 | 336 | 2500 | 1870 | 8 | 236 | 249 | 289 | 6820 | 3930 | 703 |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 8 | 6 | 0.5 | 0.8 | 9 | 15 | 1.7 | 0.7 | 1.8 | 0.7 | 12 | 15 | 0.8 |
| Selenium | EPA 6010B | 100 U | 50 U | 50 U | 50 U | 100 U | 250 U | 50 U | 50 U | 50 U | 50 U | 100 U | 250 U | 50 U |
| Selenium | HG-AFS | | | | | | 0.075 U | | | | | | 0.075 U | |
| Silver | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Thallium | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Vanadium | EPA 6010B | 6 U | 5 | 5 | 5 | 6 U | 20 U | 6 | 9 | 42 | 9 | 6 | 20 U | 7 |
| Zinc | EPA 6010B | 20 U | 10 U | 10 U | 10 U | 20 U | 50 U | 10 U | 10 U | 20 | 10 U | 20 U | 50 U | 10 U |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | | | | | | | |
| Antimony | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Arsenic | EPA 200.8 | 4 | 2 U | 1 | 1 | 2 | 3 | 1.6 | 4.7 | 3.6 | 5.8 | 1 | 2 U | 16.4 |
| Arsenic | HG-AFS | | | | | | 0.206 | | | | | | 0.050 U | |
| Beryllium | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Cadmium | EPA 6010B | 4 U | 2 U | 2 U | 2 U | 4 U | 10 U | 2 U | 2 U | 2 U | 2 U | 4 U | 10 U | 2 U |
| Calcium | EPA 6010B | 214000 | 123000 | 9730 | 9710 | 314000 | 456000 | 17000 | 7540 | 26200 | 14300 | 408000 | 444000 | 22800 |
| Chromium | EPA 6010B | 10 U | 5 U | 5 U | 6 | 10 U | 20 U | 5 U | 5 U | 5 | 5 U | 10 | 20 U | 5 U |
| Copper | EPA 200.8 | 3 | 2 U | 0.9 | 0.5 U | 8 | 8 | 5.9 | 1.1 | 2 | 0.6 | 7 | 13 | 0.5 U |
| Iron | EPA 6010B | 1180 | 80 | 8550 | 9580 | 9340 | 17500 | 50 U | 5370 | 9630 | 7130 | 181000 | 32800 | 28000 |
| Lead | EPA 200.8 | 5 U | 5 U | 1 U | 1 U | 5 U | 10 U | 1 U | 1 U | 1 U | 1 U | 5 U | 10 U | 1 U |
| Magnesium | EPA 6010B | 612000 | 312000 | 10100 | 10300 | 671000 | 999000 | 20200 | 10100 | 55200 | 11800 | 656000 | 960000 | 20600 |
| Manganese | EPA 6010B | 154 | 119 | 366 | 363 | 2640 | 1930 | 8 | 281 | 199 | 304 | 7040 | 3990 | 712 |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.0206 | 0.02 U | 0.02 U | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 8 | 4 | 0.7 | 0.5 | 10 | 15 | 1.6 | 0.9 | 1.2 | 0.6 | 11 | 15 | 0.8 |
| Selenium | EPA 6010B | 100 U | 100 | 50 U | 50 U | 100 U | 250 U | 50 U | 50 U | 50 U | 50 U | 100 U | 250 U | 50 U |
| Selenium | HG-AFS | | | | | | 0.075 U | | | | | | 0.075 U | |
| Silver | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Thallium | EPA 200.8 | 1 U | 1 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 1 U | 2 U | 0.2 U |
| Vanadium | EPA 6010B | 6 U | 5 | 5 | 5 | 6 U | 20 U | 6 | 10 | 14 | 9 | 6 U | 20 U | 6 |
| Zinc | EPA 6010B | 20 U | 10 U | 10 U | 10 U | 20 U | 50 U | 40 | 50 | 10 U | 10 U | 20 U | 50 U | 10 U |

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-420A 8/6/2009 | PL2-425A 8/6/2009 | PL2-443A 8/6/2009 | PL2-JF01AR 8/10/2009 | PL2-JF01AR Reanalysis 8/10/2009 | PL2-JF01B 8/10/2009 | PL2-JF01C 8/10/2009 | PL2-JF02A 8/10/2009 |
|---|---|---|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | | | | |
| 1,1,1-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,1,2,2-Tetrachloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichlorotrifluoroethane | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 100 U | 2 U | 2 U | 2 U |
| 1,1-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,2-Dichloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 1,2-Dichloropropane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| 2-Butanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U |
| 2-Chloroethylvinylether | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U |
| 2-Hexanone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U |
| Acetone | EPA 8260C | 10 U | 10 U | 10 U | 10 U | 500 U | 10 U | 10 U | 10 U |
| Benzene | EPA 8260C | 1 U | 1 U | 1 U | 8.1 | 50 U | 1 U | 1 U | 1 U |
| Bromodichloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Bromoform | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Bromomethane | EPA 8260C | 1 UJ | 1 UJ | 1 UJ | 1 UJ | 50 U | 1 UJ | 1 UJ | 1 UJ |
| Carbon Disulfide | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Chlorobenzene | EPA 8260C | 1 U | 1 U | 1 U | 46 | 50 U | 1 U | 1 U | 1 U |
| Chloroethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Chloroform | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Chloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| cis-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Dibromochloromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Ethylbenzene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| m,p-Xylene | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 100 U | 2 U | 2 U | 2 U |
| Methyl isobutyl ketone | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U |
| Methylene Chloride | EPA 8260C | 2 U | 2 U | 2 U | 2 U | 100 U | 2 U | 2 U | 2 U |
| o-Xylene | EPA 8260C | 1 U | 1 U | 1 U | 4 | 50 U | 1 U | 1 U | 1 U |
| Styrene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Tetrachloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Toluene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| trans-1,3-Dichloropropene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Trichloroethene | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Trichlorofluoromethane | EPA 8260C | 1 U | 1 U | 1 U | 1 U | 50 U | 1 U | 1 U | 1 U |
| Vinyl Acetate | EPA 8260C | 5 U | 5 U | 5 U | 5 U | 250 U | 5 U | 5 U | 5 U |
| Vinyl Chloride | EPA 8260C | 1 U | 1 U | 1 U | 1100 E | 1300 | 9 | 1 U | 1 U |
| **PCBs (µg/L)** | | | | | | | | | |
| Aroclor 1016 | EPA 8082 | | | | | | | | |
| Aroclor 1221 | EPA 8082 | | | | | | | | |
| Aroclor 1232 | EPA 8082 | | | | | | | | |
| Aroclor 1242 | EPA 8082 | | | | | | | | |
| Aroclor 1248 | EPA 8082 | | | | | | | | |
| Aroclor 1254 | EPA 8082 | | | | | | | | |
| Aroclor 1260 | EPA 8082 | | | | | | | | |
| Total PCB | EPA 8082 | | | | | | | | |

**Table A: Boeing Plant 2 – Shoreline Monitoring Groundwater Sampling Full Data Report**

| Constituent | Analytical Method | PL2-420A 8/6/2009 | PL2-425A 8/6/2009 | PL2-443A 8/6/2009 | PL2-JF01AR 8/10/2009 | PL2-JF01AR Reanalysis 8/10/2009 | PL2-JF01B 8/10/2009 | PL2-JF01C 8/10/2009 | PL2-JF02A 8/10/2009 |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (Total) (µg/L)** | | | | | | | | | |
| Antimony | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Arsenic | EPA 200.8 | 0.5 | 18.5 | 1.7 | 0.5 U | | 1 U | 4 | 0.3 |
| Arsenic | HG-AFS | | | | | | | 0.462 | |
| Beryllium | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Cadmium | EPA 6010B | 2 U | 2 U | 2 U | 2 U | | 2 U | 4 U | 2 U |
| Calcium | EPA 6010B | 12500 | 24400 | 26500 | 40400 | | 103000 | 218000 | 20700 |
| Chromium | EPA 6010B | 5 U | 5 U | 5 U | 5 U | | 5 U | 10 U | 5 U |
| Copper | EPA 200.8 | 0.6 | 0.6 | 1.3 | 0.7 | | 2 | 7 | 1 |
| Iron | EPA 6010B | 6800 | 40800 | 10800 | 12700 | | 35400 | 14200 | 6600 |
| Lead | EPA 200.8 | 1 U | 1 U | 1 U | 1 U | | 2 U | 5 U | 1 U |
| Magnesium | EPA 6010B | 20000 | 12900 | 36500 | 51700 | | 143000 | 638000 | 24100 |
| Manganese | EPA 6010B | 226 | 593 | 320 | 996 | | 1820 | 420 | 454 |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 0.6 | 0.9 | 1.4 | 1.2 | | 3 | 9 | 1 |
| Selenium | EPA 6010B | 50 U | 50 U | 50 U | 50 U | | 50 U | 100 U | 50 U |
| Selenium | HG-AFS | | | | | | | 0.203 | |
| Silver | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Thallium | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Vanadium | EPA 6010B | 15 | 8 | 6 | 11 | | 5 | 10 | 5 |
| Zinc | EPA 6010B | 10 U | 10 U | 10 U | 10 U | | 10 U | 20 U | 10 U |
| **Inorganics (Dissolved) (µg/L)** | | | | | | | | | |
| Antimony | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Arsenic | EPA 200.8 | 0.5 U | 18.6 | 1.5 | 0.9 | | 1 U | 9 | 0.3 |
| Arsenic | HG-AFS | | | | | | | 1.54 | |
| Beryllium | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Cadmium | EPA 6010B | 2 U | 2 U | 2 U | 2 U | | 2 U | 4 U | 2 U |
| Calcium | EPA 6010B | 14400 | 25900 | 30100 | 44300 | | 109000 | 225000 | 20300 |
| Chromium | EPA 6010B | 5 U | 5 U | 5 U | 5 | | 5 U | 10 U | 5 U |
| Copper | EPA 200.8 | 0.6 | 0.5 U | 1.1 | 0.5 U | | 1 | 2 U | 0.5 U |
| Iron | EPA 6010B | 8030 | 40200 | 12400 | 14200 | | 27800 | 11100 | 5340 |
| Lead | EPA 200.8 | 1 U | 1 U | 1 U | 1 U | | 2 U | 5 U | 1 U |
| Magnesium | EPA 6010B | 21000 | 13900 | 44800 | 55900 | | 145000 | 661000 | 23900 |
| Manganese | EPA 6010B | 356 | 602 | 357 | 1120 | | 1870 | 407 | 417 |
| Mercury | EPA 7470A | 0.02 U | 0.02 U | 0.02 U | 0.02 U | | 0.02 U | 0.02 U | 0.02 U |
| Nickel | EPA 200.8 | 0.8 | 0.9 | 1.6 | 1.2 | | 3 | 7 | 1.1 |
| Selenium | EPA 6010B | 50 U | 50 U | 50 U | 50 U | | 50 U | 100 | 50 U |
| Selenium | HG-AFS | | | | | | | 0.211 | |
| Silver | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Thallium | EPA 200.8 | 0.2 U | 0.2 U | 0.2 U | 0.2 U | | 0.5 U | 1 U | 0.2 U |
| Vanadium | EPA 6010B | 14 | 8 | 7 | 12 | | 3 | 6 | 6 |
| Zinc | EPA 6010B | 10 U | 10 U | 10 | 10 U | | 10 U | 20 U | 10 U |

Notes:
Chromium groundwater screening level based on chromium VI
Shading indicates concentration exceeds Plant 2 screening level or background level
B- Inidcates possible/probable blank contamination
U - Target analyte was not detected at the reported concentration.
E - Indicates value above the linear range of the detector. Sample dilution required.
J - Inidcates an estimated concentration when the value is less than the calculated reporting limit.

# Attachment B

# TECHNICAL MEMORANDUM

| | | | |
|---|---|---|---|
| **Date:** | 4/29/2010 | **Project No.:** | 013-1646-010.700.01 |
| **To:** | Will Ernst | **Company:** | The Boeing Company |
| **From:** | Jill Lamberts, Staff Environmental Scientist; Kent Angelos, Principal and Project Director | | |
| **cc:** | Doug Kunkel, EPI | **Email:** | jill_lamberts@golder.com |

**RE: BOEING PLANT 2 – SHORELINE AREA Q1 SEMI-ANNUAL 2010 GROUNDWATER MONITORING DATA VALIDATION QA/QC REVIEW**

## 1.0 INTRODUCTION

A total of 33 groundwater samples (including one field duplicate) and five trip blank samples were collected February 8-11, 2010 as part of the Boeing Plant 2 Shoreline Area Groundwater Monitoring Project. Selected samples were analyzed by Analytical Resources Incorporated (ARI) of Tukwila, Washington for the following parameters:

- Volatile organic compounds (VOCs) by EPA Method 8260C – 39 VOCs.
- Polychlorinated biphenyls (PCBs) by EPA Method 8082
- Total and Dissolved Metals (Priority Pollutant Metals - Silver, Arsenic, Beryllium, Cadmium, Chromium, Copper, Mercury, Nickel, Lead, Antimony, Selenium, Thallium, and Zinc. Additional metals – Calcium, Iron, Magnesium, Manganese, and Vanadium) by EPA Methods 200.8, 6010B, and 7470A.

Samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA SW-846, 3rd edition) 8082, 8260C*, *6010B, 7470A metals, EPA Method 200.8, Revision 5.5; Determination of Trace Elements in Water and Wastes by Inductively Coupled Plasma-Mass Spectrometry, and Frontier Standard Operating Procedures.*

## 2.0 SAMPLE DELIVERY GROUPS, SAMPLES AND ANALYSES

Upon receipt, samples were placed in batch numbers. Samples were analyzed and results reported by the laboratory in the sample delivery group (SDG) and batch number as summarized below:

**QI92, QI93 (VOCs and Dissolved and Total Metals):**

| | | |
|---|---|---|
| GW100208-PL2-044B | GW100208-PL2-043B | GW100208-PL2-030A |
| GW100208-PL2-030C | GW100208-PL2-013A | GW100208-PL2-607A |
| Trip Blank | | |

**QI95, QI96 (VOCs and Dissolved and Total Metals):**

| | | |
|---|---|---|
| GW100208-PL2-JF01AR | GW100208-PL2-JF01B | GW100208-PL2-JF01C |
| GW100208-PL2-JF02A | Trip Blank | |

**QJ15, QJ17 (VOCs, PCBs, and Dissolved and Total Metals):**

| | | |
|---|---|---|
| GW100209-PL2-015A | GW100209-PL2-015AR | GW100209-PL2-015B |
| GW100209-PL2-026C | GW100209-PL2-036A | GW100209-PL2-036AR |
| GW100209-PL2-425A | GW100209-PL2-425C | GW100209-PL2-DUP1 |
| Trip Blank | | |

**QJ35, QJ41 (VOCs and Dissolved and Total Metals):**

| | | |
|---|---|---|
| GW100210-PL2-258A | GW100210-PL2-258B | GW100210-PL2-258C |



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| | | |
|---|---|---|
| GW100210-PL2-271A | GW100210-PL2-214A | GW100210-PL2-214B |
| GW100210-PL2-214C | GW100210-PL2-232A | Trip Blank |

**QJ60, QJ61 (VOCs and Dissolved and Total Metals):**

| | | |
|---|---|---|
| GW100211-PL2-227A | GW100211-PL2-233A | GW100211-PL2-420A |
| GW100211-PL2-420C | GW100211-PL2-443A | GW100211-PL2-443C |
| Trip Blank | | |

Quality assurance/quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan. The data validation QA/QC review focused primarily on laboratory result summary sheets and quality control summary sheets to ensure that work plan data quality objectives were met for the project. The validation level for VOCs and PCBs is Level 1, as described in the Quality Assurance Project Plan (QAPP) Addendum Amendment (Weston, 2003). The validation level for the metals data is Level 2, as described in the work plan (Weston, 2001).

Data validation was conducted in accordance with the criteria outlined in the National Functional Guidelines for Organic Data Review (EPA, 2008) and the National Functional Guidelines for Inorganic Data Review (EPA, 2004), modified to include method specific requirements of the laboratory analytical methods. Raw data sheets were reviewed as necessary to confirm conditions reported and to support application of qualifiers to analytical results.

The following is a summary of quality control elements associated with each analytical fraction and the status of that element as a result of the data validation process.

## 3.0 SAMPLING, DOCUMENTATION AND REPORTING

Sample acknowledgements, chain-of-custody, request forms and data package completeness were evaluated with the following noted:

- SDGs QI93, QI96, QJ15, QJ41, and QJ61: refer to these SDGs for low level mercury results.
- SDGs QI92, QI93, QI95, QI96, QJ35, and QJ41: Cooler receipt forms indicate that multiple coolers were received at temperatures greater than 6°C. No action was required since samples were collected and delivered on the same day and there was not sufficient time for the samples to cool to the correct temperature.
- SDG QI92: Cooler receipt form indicates there were many small bubbles in all 3 VOC vials of sample GW100208-PL2-030C. No action was taken other than to note.
- SDG QI95: Cooler receipt form indicates there were pea bubbles in all 3 VOC vials of sample GW100208-PL2-JF01C. No action was taken other than to note.
- SDG QJ17: Cooler receipt form indicates there were large bubbles in all 3 VOC vials of sample GW100209-PL2-015B. The sample was **qualified estimated (J/UJ)** for having bubbles >4 mm in size and being analyzed after more than 7 days.
- SDGs QJ17 and QJ60: The 2010 monitoring schedule indicates that 4 new wells were added to be analyzed for total and dissolved Mn and Ni. Samples were only submitted for dissolved Mn and Ni. Upon discussion with the PM, no action was taken since a letter from EPA dated 9/4/09 did not specify the required fraction. Future sampling events will have results for both total and dissolved Mn and Ni.
- All SDGs: Trip Blanks dated 1/26/2010 were analyzed out of the 14 day hold time. No action was required since these Trip Blanks were provided by ARI.
- Results for volatile organic compound 1, 1, 2-trichloro-1, 2, 2-trifluoroethane are reported in a truncated format (1, 1, 2-trichloro-1, 2, 2-trifluoroe) due to ARI report format. No action was taken.

- All SDGs: A cursory review of total and dissolved fractions for metals found that in many cases, the total fraction was less than the dissolved fraction. In most cases the issue can be attributed to analytical variability, with sample results having RPDs < 20% or are < 5X the RL. However, a few cases remain where the total fraction was significantly less than the dissolved fraction. No other action was required as part of the Level I DV review.

## 4.0 VOLATILE ORGANIC COMPOUNDS

Level 1 data packages were provided for the VOC analysis. The items reviewed during validation are summarized below.

### 4.1 Analytical Methods – *acceptable*

Samples for VOC analysis were analyzed by gas chromatography/mass spectrometry (GC/MS) using EPA SW846 Method 8260C. The QAPP lists the method for VOCs as 8260B. ARI recently updated their methods due to a NELAP audit and a memo dated 6/1/2009 was sent to Boeing, EPI, and Golder Project Managers informing them of the change.

### 4.2 Sample Holding Times and Preservations

All samples were prepared and analyzed within 14 days of sample collection (preserved water samples) or within 7 days of sample collection (unpreserved water samples) with the following exceptions:

- SDG QI92 and QI95: All samples received with a pH < 2 except for samples GW100208-PL2-044B, GW100208-PL2-043B, and GW100208-PL2-JF01C, which were received at a pH of 5, 7, and 7, respectively. No action was required since samples were analyzed in fewer than 7 days.
- SDG QJ17 and QJ35: All samples were received with a pH < 2 except for samples GW100209-PL2-015B, QJ17-Trip Blank, and GW100210-PL2-214C, which were received at a pH of 5, 5, and 7, respectively. No action was taken on sample GW-100210-PL2-214C since it was analyzed in fewer than 7 days. Samples GW100209-PL2-015B and QJ17-Trip Blank were **qualified as estimated (J/UJ)** since they were analyzed in more than 7 days.
- SDG QJ60: All samples were received with a pH < 2 except for sample QJ60-Trip Blank, which was received at a pH of 5. No action was taken since it was analyzed in fewer than 7 days.
- SDG QI92: Cooler receipt form indicates there were many small bubbles in all 3 VOC vials of sample GW100208-PL2-030C. No action was taken other than to note. Samples were analyzed in fewer than 7 days.
- SDG QI95: Cooler receipt form indicates there were pea bubbles in all 3 VOC vials of sample GW100208-PL2-JF01C. No action was taken other than to note. Samples were analyzed in fewer than 7 days.
- SDG QJ17: Cooler receipt form indicates there were large bubbles in all 3 VOC vials of sample GW100209-PL2-015B. The sample was **qualified as estimated (J/UJ)** for having bubbles >4 mm in size and being analyzed after more than 7 days.

### 4.3 Laboratory Reporting Limits

The laboratory achieved the reporting limits (RLs) required by the approved quality assurance project plan (EPI, 2007) with the following exceptions:

- The laboratory achieved the reporting limits (RLs) required by the approved quality assurance project plan (Weston, 2001). ARI analyzed thirteen additional compounds not listed on Table 5 of the QAPP (Chloromethane, Bromomethane, 2-Butanone, Carbon Disulfide, Vinyl Acetate, 1,2-Dichloropropane, cis-1,3-Dichloropropene,

Dibromochloromethane, trans-1, 3-Dichloropropene, 2-Chloroethylvinylether, 4-Methyl-2-Pentanone, 2-Hexanone, and Styrene).

- It should be noted that Table 5 of the QAPP lists 1,1,2,2-Tetrachloroethene though it should read 1,1,2,2- Tetrachloroethane. Compound 1,1,2,2-Tetrachloroethene is already listed as its synonym - Tetrachloroethene.
- The acetone RL was reported by the lab at 10 µg/L instead of the requested 5 µg/L. The lab was contacted and it was determined that there was a recent increase in the RL. The EPA will be notified of this change by memo.
- The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds.

## 4.4 Instrument Calibration

Calibration review is not required under the QAPP; however, the lab provided information on the calibration performance in the case narratives. All of the calibration criteria were met with the following exceptions:

- SDGs QJ17 and QJ35: The case narrative listed that the CCAL from 2/17/2010 and 2/18/2010 was out of control low for 2-chlorovinylether. The lab qualifies detects as "Q" (%D > 20%). All results from both SDGs were **qualified as estimated (J/UJ)** on 2-CEVE due to possible low bias.

## 4.5 Blank Contamination – *acceptable*

The method blanks were free of contamination.

## 4.6 Surrogate Recovery – *acceptable*

All surrogate recoveries were within control limits.

## 4.7 Matrix Spike Compound Recovery

No MS/MSDs were performed for VOCs. Please refer to LCS/LCSD for precision and accuracy information.

## 4.8 Laboratory Control Sample Recovery – *acceptable*

Laboratory control/laboratory control sample duplicate (LCS/LCSD) were evaluated using the QA plan. The QA Plan provided advisory limits for an abbreviated compound list (5 compounds) whereas ARI provided a longer LCS/LCSD compound list (39 compounds). Spike recovery control limits have been updated since the QA Plan but limits are generally similar if not more stringent than advisory limits stipulated in the QA plan. LCS/LCSD results were acceptable for all client target analytes.

## 4.9 Field Duplicate Sample Analysis – *acceptable*

Field duplicate samples were collected and analyzed as follows:

| Laboratory SDG | Sample | Field Duplicate Sample |
|---|---|---|
| QJ17 | GW100209-PL2-015AR | GW100209-PL2-DUP1 |

Field duplicate analysis criteria were met.

# 5.0 POLYCHLORINATED BIPHENYLS

The laboratory provided a Level I package for the PCB analysis; the items reviewed during validation are summarized below.

## 5.1 Analytical Methods – *acceptable*

Samples for PCB analysis were analyzed by gas chromatography/electron capture detector (GC/ECD) using EPA SW846 Method 8082.

## 5.2 Sample Holding Times – *acceptable*

All samples were extracted within 7 days of collection and analyzed within 40 days of sample extraction.

## 5.3 Laboratory Reporting Limits – *acceptable*

The following sampling, documentation, and reporting discrepancies are noted:

- SDG QJ17: Two additional analytes, Aroclor 1221 and Aroclor 1232, beyond those specified in the QAPP were analyzed and reported (no detects).
- The requested reporting limits were met by the laboratory.
- The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

## 5.4 Blank Contamination – *acceptable*

The method and equipment blanks were free of target compounds.

## 5.5 Surrogate Recovery – *acceptable*

All surrogate recoveries were within control limits.

## 5.6 Matrix Spike Compound Recovery

Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses were not performed. Refer to laboratory control sample data for precision and accuracy.

## 5.7 Laboratory Control Sample Recovery – *acceptable*

Laboratory control samples (LCS) were evaluated using the QA plan. The QA Plan provided advisory limits for one compound (Aroclor 1242) whereas ARI provided LCS/LCSD compounds Aroclors 1016 and 1260. No action was taken on this basis. Spike recovery control limits have been updated since the QA Plan but limits are generally similar if not more stringent than advisory limits stipulated in the QA plan. LCS/LCSD results were acceptable.

## 5.8 Field Duplicate Sample Analysis

No field duplicate samples were collected and analyzed for PCBs.

# 6.0 INORGANICS

The laboratory provided a full data package for the inorganic analysis; the items reviewed during validation are summarized below.

## 6.1 Analytical Methods – *acceptable*

Samples for trace mercury analysis were prepared and analyzed by cold vapor atomic absorption spectrometry EPA Method 7470A. Samples for all other metals analysis were prepared using EPA Methods 3005A, 3010A or 200.8, acid digestion. With the exception of mercury, metals analysis was completed by EPA Methods 6010B or 200.8.

## 6.2 Sample Holding Times and Preservation – *acceptable*

All samples were prepared and analyzed within the recommended holding period from the date of collection; 180 days for metals and 28 days for mercury. Preservations were checked by the lab upon receipt and any failing preservations were adjusted immediately to pH < 2. Preservation failures are listed below:

- SDG QI93: Preservation failed for the total and dissolved mercury bottles of GW100208-PL2-043B. Bottles were adjusted to pH < 2 with HNO3 upon receipt. No further action was required.
- SDG QJ15 and QJ17: The total and dissolved mercury bottles and the total metals bottle for GW100209-PL2-015B had a pH of > 2. Bottles were adjusted to pH < 2 with HNO3 upon receipt. No further action was required.

## 6.3 Laboratory Reporting Limits

The laboratory Practical Quantitation Limits (PQLs) required by the approved quality assurance project plan addendum and addendum amendment (Weston, 2001, EPI, 2003 and 2004 and 2008) were met with the following exceptions:

| Parameter | EPA Method | QAPP PQL (µg/L) | Lab Reported PQL (µg/L) |
|---|---|---|---|
| Mercury low level | 7470A | 0.005 | 0.020 |
| Zinc | 6010B | 4 | 10 |

- It is noted from a previous telephone conversation of Jessie Compeau of Informa with the laboratory (on 12/16/04) that the PQLs could not always be achieved due to the sample matrix, and that dilutions were made during sample analysis due to the salty nature of the samples. No action was taken for elevated reporting limits.
- Early 2007, due to ongoing zinc contamination within ARI's metals laboratory, zinc reporting level for EPA Method 6010B was revised from 4 µg/L to 10 µg/L. The revised reporting limit is slightly higher than the approved quality assurance project plans. No action was taken.
- Boeing's consultant (EPI) added manganese to the metals list on August 9, 2005. Manganese reporting limit is not listed in the QAPP. No action was taken.
- Calcium, iron, and magnesium were also added to the metals list. Required reporting limits are not listed in the QAPP. No action was taken.
- The QAPP stipulates that low level mercury analysis is to be performed by Brooks Rand LLC, in Seattle, WA. Low level mercury analysis was to be performed by EPA Method 1631E. In late 2005 ARI satisfactorily adapted and tested a low level mercury method, EPA Method 7470A. Since May of 2006 ARI has been performing low level mercury analysis for this project at the approved RL listed above.
- The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.
- In several cases in all SDG, dissolved fractions were greater than total fractions. No action was taken other than to note this.

## 6.4 Instrument Calibration

A review of the instrument calibration was performed. All of the calibration and continuing calibration criteria were met with the following notes:

- SDG QJ60: CCV6 for Cu analyzed on 4/1/2010 was slightly out of control high. Sample GW100211-PL2-233A (total fraction) was **qualified as estimated (J).** The other affected samples were qualified due to CCB contamination (see below).

## 6.5 Blank Contamination

The method blank and equipment blanks were free of target compounds with the following exceptions:

- SDG QJ35: The MB for total metals contained Zn at 10 ug/L. No action was taken as all associated samples were ND.
- SDGs QJ17 and QJ35: Some CCBs were had Cu contamination. No action was necessary as there were no bracketing samples.
- SDG QJ60: CCB6 for Cu analyzed on 4/1/2010 contained Cu above the RL at 1.4 ug/L. Sample GW100211-PL2-233A was **qualified as a non-detect (U);** samples GW100211-PL2-443A, GW100211-PL2-227A, and GW100211-PL2-443A were **qualified as estimated (J+).**

## 6.6 Laboratory Control Sample Recovery – *acceptable*

LCS (blank spike) recoveries were within QC limits of 80 to 120 percent.

## 6.7 Matrix Spike Analysis

Matrix spike (MS) analysis was performed on selected samples in analytical batches. The metals MS percent recoveries were acceptable with the following exceptions:

- SDGs QI95, QI96, QJ60: No MSs were analyzed in these SDGs. Refer to LCS/LCSD recoveries and batch QC for accuracy and precision information.
- SDG QI92: A matrix spike was performed on sample GW100208-PL2-043B. Spike recoveries for total and dissolved Ca and Mg were out of control. No further action was required because the MS was qualified 'H' by ARI to indicate that the Ca and Mg concentrations in the spiked samples were greater than 4X the spike amount.
- SDG QJ17: A matrix spike was performed on sample GW100209-PL2-015A. Spike recoveries for total and dissolved Ca and Mg were out of control. No further action was required because the MS was qualified 'H' by ARI to indicate that the Ca and Mg concentrations in the spiked samples were greater than 4X the spike amount.
- SDG QJ35: A matrix spike was performed on sample GW100210-PL2-258A. Spike recovery for total Fe was out of control. No further action was required because the MS was qualified 'H' by ARI to indicate that the Fe concentrations in the spiked sample was greater than 4X the spike amount.

## 6.8 Duplicate Analysis – *acceptable*

Laboratory duplicate analysis was performed on selected samples in analytical batches. Duplicate analysis criteria were met with the following exceptions:

- SDG QI92: The matrix duplicate (MD) was out of control for total Cu on GW100208-PL2-043B. No action was required since the results were less than 5X the RL.
- SDG QI92: The lab reported that the MD was out of control for dissolved As and Se on GW100208-PL2-043B. No action was required because the %RPD for As was <20% and the results for Se were less than 5X the RL.
- SDG QJ17: The lab reported that the MD was out of control for total As on GW100209-PL2-015A. No action was required since the results were less than 5X the RL.

- SDG QJ17: The lab reported that the MD was out of control for dissolved As on GW100209-PL2-015A. No action was required because the %RPD was <20%.
- SDG QJ35: The lab reported that the MD was out of control for total Cu and Ni on GW100210-PL2-258A. No action was required because the %RPDs were < 20%.

## 6.9 Interference Check Sample Analysis – *acceptable*

All interference check sample analysis results for total and dissolved metals were within 20% of the true value and analyzed at the appropriate frequencies.

## 6.10 ICP Serial Dilution Analysis

All serial dilution results were less than 10% difference for detections greater than 50X the MDL with the following exceptions:

- SDG QJ35: The total Fe serial dilution %D was 11.1% and >50X the MDL. The associated samples for total Fe were **qualified as estimated (UJ/J).**

## 6.11 Field Duplicate Sample Analysis

Field duplicate samples were collected and analyzed as follows:

| Laboratory SDG | Sample | Field Duplicate Sample |
|---|---|---|
| QJ17 | GW100209-PL2-015AR | GW100209-PL2-DUP1 |

Field duplicate analysis criteria were met with the following exceptions:

- Total metals %RPDs were all < 20% except for Fe, Mn, and V. No action was taken for Mn and V since the results were < 5X the RL. Total Fe was already qualified due to the serial dilution, so no further action was necessary.

# 7.0 DATA QUALIFIERS

Data qualifiers applied by the laboratory have been removed from the data summary report sheets and superseded by data validation qualifiers as follows:

The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

U – The constituent was analyzed for, but was not detected above the reported sample quantitation limit.

J – The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.

J+ – The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result may be biased high.

J- – The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result may be biased low.

UJ – The constituent was not detected; the associated quantitation limit is an estimated value because quality control criteria were not met.

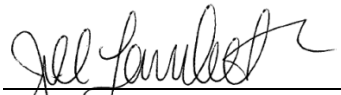
R – Data are rejected due to significant exceedance of quality control criteria. The analyte may or may not be present. Additional sampling and analysis may be required to determine the presence or absence of the constituent. For statistical reasons, rejected values are not included in the database.

UR – The constituent is rejected at the reported quantitation limit.

Y – The reporting limit is elevated due to interference. The result is not detected.

## 8.0 DATA ASSESSMENT

Data review and validation was performed by an experienced quality assurance chemist independent of the analytical laboratory and not directly involved in the project. This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment, the data are acceptable for use except where indicated by data qualifiers, which may modify the usefulness of those individual values.



Jill Lamberts
Staff Environmental Scientist, Golder

April 29, 2010
Date

Kent Angelos
Principal & Project Director, Golder

April 29, 2010
Date

## 9.0 REFERENCES

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